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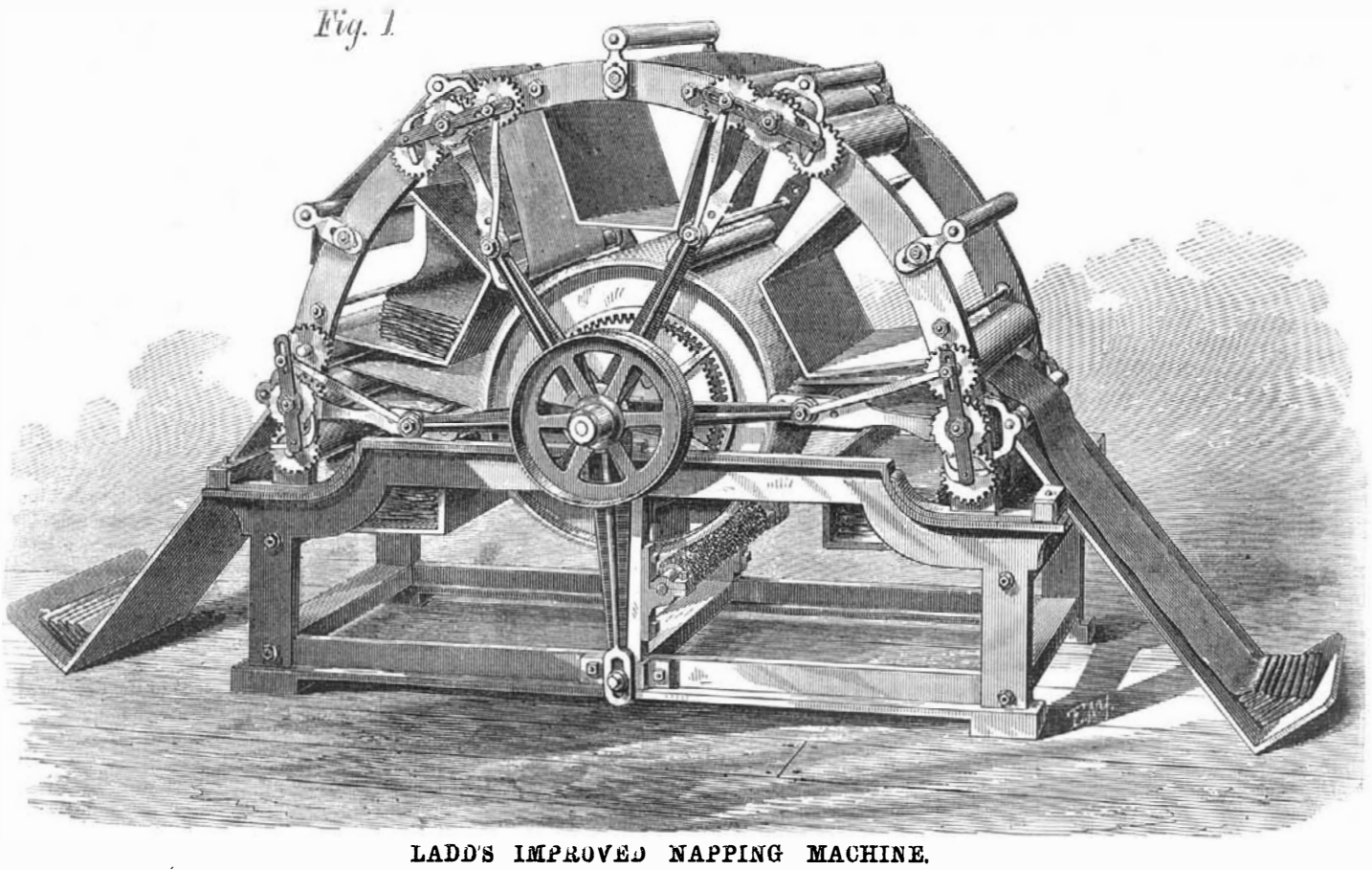
IMPROVED NAPPING MACHINE.

Our engravings illustrate an improved machine for raising the pile or nap on woolen and cotton fabrics. It appears to be well calculated for the intended purpose, and is undoubtedly a very ingenious invention.

In Fig. 1 is given a perspective view of the machine, which is intended to be run by steam or other power. It will be seen to consist essentially of a central cylinder and four systems of rollers, all of which are operated by the one driving shaft. The central, or napping cylinder, carries on its periphery the cards or teasles by means of which the pile is raised. Each system of rollers performs the duties of carrying in the cloth, presenting it to the operation of the napping cylinder, and carrying it away again to a fitting receptacle, as shown in the engraving. It follows, therefore, that as many pieces of cloth may be napped as there are systems of rollers; and their number may of course be increased or diminished according to convenience. As the operation of the machine is complete in each system, an explanation of one will explain the whole, and the reader will now, therefore, please refer to Fig. 2, in which one system of rollers and the driving mechanism of the machine are shown in detail.

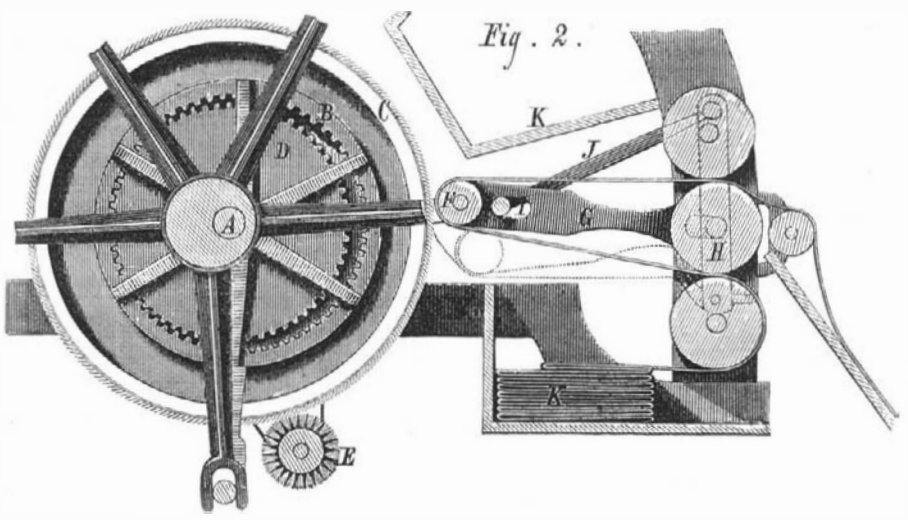
Fig. 1.



LADD'S IMPROVED NAPPING MACHINE.

A is the driving shaft. To it is attached the eccentric shown, by means of which the four arms which operate the four systems of rollers are actuated and made to oscillate and to advance and recede alternately; their motion is circumscribed by a fifth arm, which slides on a fixed bearing at the lower part of the machine, as delineated. On the shaft, A, behind the eccentric shown is placed a second eccentric, by which the gear wheel, B, is worked. This wheel, B, is limited to an upward and downward and oscillating movement, by a contrivance similar to that by which the movement of the arms is circumscribed. To the napping cylinder, C, is attached the inner gear, D. They both run loose on the shaft, A, and an intermittent revolving movement is produced in them by the action of the gear, B. The roll, E, which is run by a hand and pulley on the further end of the shaft, A, is arranged for keeping the napping cards, etc., clear. We will now examine the system of rollers. The roller, F, is carried by the arm, G, the further end of which is slotted and engages with the shaft of the roller, H, in the manner indicated by the dotted lines. The driving arm of this system (which is broken off in the engraving) has a rod, as shown, which passes through the slot, I, in the arm, G. The outer end of this rod is provided with a pivoted arm, J, which is adjustably attached to a lever, the other end of which carries a spring pawl, which latter actuates a ratchet wheel attached to the shaft of the roller, H. This ratchet actuating mechanism which is partly shown and indicated by dotted lines in Fig 2, is so fully shown in Fig. 1 as to require no further explanation, and it will readily be seen, on inspection thereof, how the outward movement of the rod results in a partial revolution of the roller, H. The two rollers geared to H, of course, make corresponding movements in the opposite direction. At K is the cloth to be napped; it passes from the recess in which it lies round the lower roller, between that and the roller, H, round the roller, F, and thence between the roller, H, and the one above it, whence it passes over a small outside guiding roller into a suitable receptacle.

Fig. 2.



In the operation of the machine, on each revolution of the driving shaft, the napping cylinder is moved forward slightly in its revolution and brought again to a stand, while the roller, F, which presents the cloth to the napping cards, is moved eccentrically away from and then towards the cards; at the same time the action of the ratchet device causes a partial revolution of the roller, H, and the cloth is consequently fed in by the lower pair of rolls, and withdrawn by the upper to the same extent. In this way every portion of the surface of the cloth is presented to the nappers, and the operation is performed in a highly effective manner.

By adjusting the ratchet mechanism suitably, the roller, F, can be made to approach the napping cylinder more or less, as may be desired, and by this means the thickness of the layer of fabric raised into pile can be precisely determined, which makes the machine of peculiar value in the manufacture of canton flannels, where the strength of the flannel is frequently jeopardized by the depth of the nap.

Among the advantages claimed for this machine are the small space it occupies, the non-liability to get out of order, and the facilities it gives for inspecting the work as it is performed. Should the fabric not be sufficiently napped on passing one set of rolls, it may readily be subjected to the action of another set before leaving the machine; and if it is designed to nap both sides of the cloth at one operation, the object is easily accomplished by passing it through a second set of rolls in reversed order. Piece after piece of cloth may be carried through the machine by simply sewing the end of one piece to that of the next.

The device is patented, and further information in regard to it may be obtained by addressing the inventor, Mr. Calvin P. Ladd, of the Ridgewood Works, Bloomfield, N. J.

A New Molding Material.

Colonel Muratori, an Italian inventor, has recently discovered a new composition corresponding to the *gesso duro, stucco duro* (hard plaster of Paris, hard stucco), which was used by the Cinque Centisti in the 16th century, and was subsequently unfortunately lost.

Like plaster of Paris, it may be used for casts. It hardens slowly, and the artist thereby has all the time he requires. Dry, it becomes very hard, and no longer receives stains. Even oil dropped on it then does not discolor it. And it can be cleaned and washed without in any way injuring the most minute and delicate details.

Its color is transparent snow white, dull, or lustrous, if so wanted; for any part of the surface is susceptible, by simple friction, of assuming a kind of crystalline enamel. Mixed with ordinary colors it retains all the properties above detailed, and most beautiful imitations can thus be made. The price of this new material is not likely to surpass the price of fine plaster of Paris.

The process of manipulation remains the same; no novelty of apparatus or handling requires to be introduced, whether the material be worked by an artist, by a skilled or common workman, and it is all these qualities combined which render it of such very great importance as a substitute for plaster of Paris for all artistic works.

Another application of the same kind deserves mention, for it also possesses a high importance. Any object whatsoever of plaster of Paris dipped into a bath of the composition comes out covered with a kind of enamel, the most minute details remaining uninjured. The solution in the bath, which is called liquid enamel, has the following properties:

It preserves and cleans plaster of Paris objects without altering, affecting, or injuring their minutest details; it gives them a beautiful transparency, and they may be left dull or made lustrous at will. It has no smell, and is not affected by exposure to great heat.

An Engineering Triumph.

There is a German printing office in this city where the employees have adopted an ingenious method to gratify their Teutonic proclivity for good lager. The composing room is situated a good way up in the skies, far above sublunary things, indicating a corresponding intellectual elevation. It might be supposed that under these circumstances the love of lager might receive a check. The reverse is the case. The back door of a saloon and bar room opens into a yard near the printing office. A good stout telegraph wire has been stretched from a post in the yard to a window of the room where the intellectual "comps" perform their arduous labors. When a supply of the stimulant is required, the tinkling of a bell arrests the attention of the bar keeper, and a set of tins or buckets, filled with the sparkling beverage, are drawn along the wire, and safely landed at the window.

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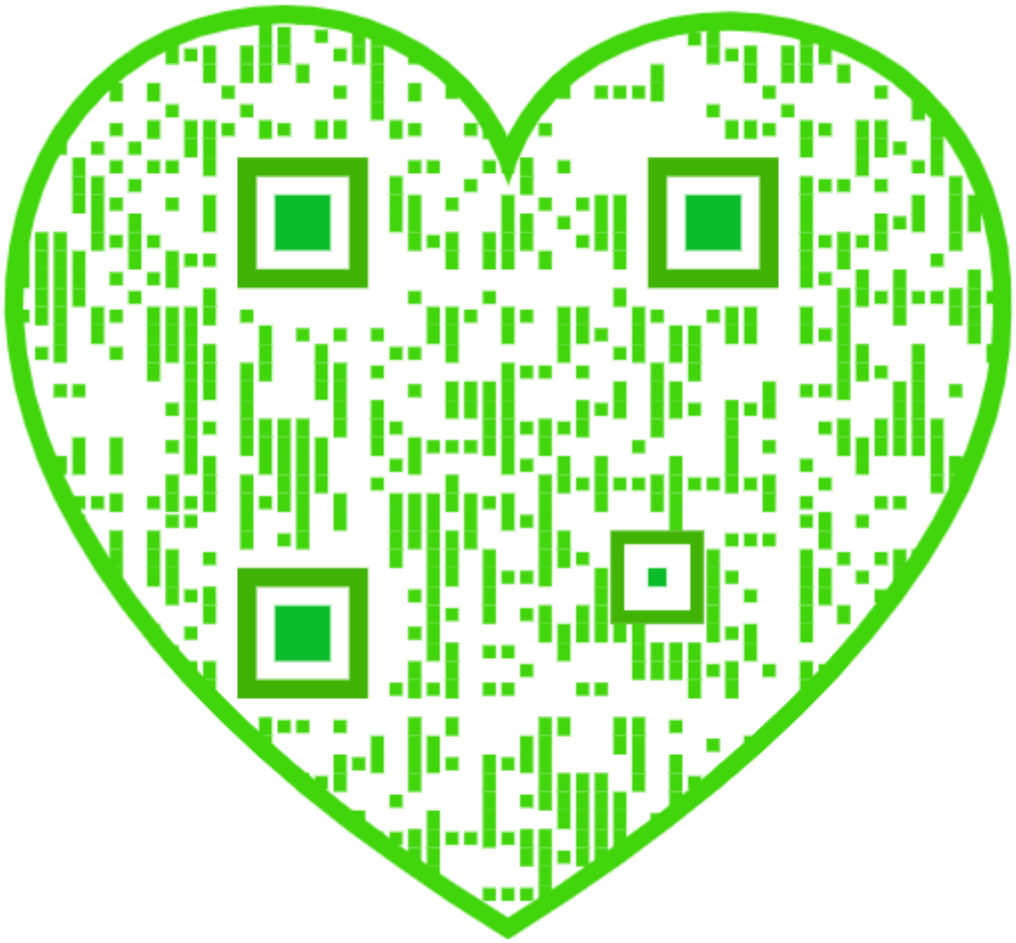

It has been well said that necessity is the mother of invention, and this is an apt illustration of the saying.—*St. Louis Republican.*

The Manufacture of Textile Fabrics at Pompeii.

Some interesting particulars of the ancient method of cleansing and finishing woven fabrics, as revealed by the ruins of Pompeii, are given by M. Beulé, who inspected the remains of a fulling and bleaching establishment in the buried city. The house in question was unearthed some time back, but the descriptions of its contents seem to have been confined to the pictures.

The largest and best executed paintings representative of the art were discovered in 1820, in the house of a fuller, opening on one side on the street of Mercury, and on the other on a street called, after him, Fullonica. In the court, a pillar covered with pictures was standing alongside a fountain. This pillar has been removed and deposited in the Naples Museum. In the lowest division, a woman, sitting, hands a piece of cloth to a little female slave. A workman, whose tunic is closely tied around the body, is looking at them, while at the same time carding a white cloak with a purple border, suspended from a stick. Another workman is in the act of sitting down alongside a crate of wicker work on which the cloth is to be spread out; in one hand he holds a vase on which sulphur thrown on burning charcoal will develop a gas capable of bleaching the cloth. This is the same method, says M. Beulé, which is used to-day. On another face of the pillar, arched niches contain large vats where the goods are soaked. Slaves standing in those vats trample the fabric with their bare feet in the same manner as Arabian women wash their linen by trampling them against the rocky bed of a stream; this is what the ancients called "the fuller's dance" (*saltus fullonicus*). The artist has painted with the same care the press with its two uprights, its two enormous screws, which were turned by means of cranks in order to flatten the cloth beneath the planks which imparted the necessary finish. Finally, the drying chamber is shown by long sticks hanging on chains from the ceiling. The linen is spread out on them; a slave hands to a young woman an open fabric, while the wife of the fuller makes a note of it on her tablets. I have visited with particular curiosity the houses in Pompeii where these pictures had been gathered. I counted there in a court twenty-two tanks constructed of stone, and at different levels, so that the water could run from one into the other. Little benches in front of them served for the reception of the goods. At the other end of the court, seven smaller tanks served for fulling. The store room, with traces of the planks, which were laid like rays radiating from a center, the hearths, the drying chamber, may still be recognized. In other fullers' establishments, I have seen very thick sheet lead lining the interior of vats made of cement. Sometimes, also, we find jars full of greasy earth, which must be the fuller's earth of which Pliny speaks, and which contributed as much to the whiteness of the goods as the fumigation with sulphur or the urine which was collected in vases placed at the corners of the streets. Thus, despite the differences of time and processes, it has been established, to our surprise, that moderns are but little inventive, or, rather, that the ancients had already discovered all that was essential, rational, and suited to the requirements of the art.

Hints for the Country.

In preparing grounds, it should be remembered, says the *Gardener's Monthly*, that grass and trees are not only required to grow therein, but that they must grow well. The top soil of the lot is often covered by the soil from the excavations, trusting to heavy manuring to promote fertility. But this is a too slow and expensive process. The top surface soil should, in all cases, be saved, and replaced over the baser soil. Also, where it is necessary to lower a piece of ground, the top soil should be saved to place over again. The depth of the soil is an important matter, both for the trees and the lawn. It should be at least eighteen inches deep. In shallow soils, grass will burn out under a few days of hot sun. In a soil eighteen inches deep, a lawn will be green in the driest weather. For the sake of the trees, also, the ground should be not only deep, but rich. If from thirty to forty loads of stable manure to the acre could be appropriated, it would be money well spent. Life is too short for it to be an object to wait too long for trees to grow, and planting large ones is an expensive as well as unsatisfactory business. A tree in a rich and deep soil will grow as much in one year as in five in a poor one. So in preparing a lawn, it is fortunate that, while aiming at the best effects, we are helping our trees also. It is generally better to sow for a lawn than to sod, where much of it has to be done. The edges of the road must, of course, be sodded, and the balance neatly raked over and sown. The best kind of grass to be employed in seeding is a disputed point, and it will, no doubt, depend in a great measure on the locality. In Philadelphia and northward, the perennial rye grass is excellent. It commences to grow very early, and has a peculiar lively, shining green. South of Philadelphia, it is very liable to get burned out in summer, and the Kentucky blue grass would be much better. It is much the best to have but one kind of grass for a lawn, provided it is suited to the locality. A mixture of kinds is apt to give a spotted and variegated character, not at all pleasing. Some people like to see white clover growing thickly in a lawn and others object to anything but green. However, if a good grass rake is employed freely in summer time, the heads of these flowers may be kept from expanding. Where there is a prospect of a month of growing weather, lawns may still be sown with grass seed, the clover, where used, to be kept for sowing in April or March next. A small quantity of rye should be thinly sown with the grass, which, by the shade it affords, will prevent the grass from being thrown out by the frost. The rye must, of course, be closely cut in the spring, to allow the grass to get ahead of it.

Hilgard's Magnetic Survey.

It is a fact well understood by the unlearned as well as the learned that, in determining the true north line, surveyors and civil engineers are accustomed to make certain allowances for what is called "the variation of the magnetic needle," or in other words, it is well known that the magnetic needle does not point due north. The extent of this variation differs with different periods of time, and also in different localities on the earth's surface.

Another well known fact connected with the operation of the magnetic needle is that, when suspended upon a pivot, instead of assuming an exact horizontal position, it has a slight dip toward the north, and that the extent of this dip likewise varies with the time and place. In view of these well known facts, it becomes a subject of great practical importance, as well as a matter of great interest to science, to determine the true north line of different points of the earth's surface, in order to know to what extent the needle varies from the true north course, and also to see to what extent the needle dips at different localities.

When the true north line is once established at different points, it will then be an easy matter to note, from time to time, the slightest difference, either by way of increase or diminution, of the variation of the needle from this true line from year to year. The true north line is found by an astronomic observation, and the process of ascertaining the true meridian line and measuring the intensity of the magnetic force which controls the variation and dip of the needle is called a magnetic survey.

Such a survey of the United States, says the St. Louis *Republican*, is now being made by Dr. I. C. Hilgard, under the auspices of the American Academy of Science. Dr. H. has established a station at Compton Hill, St. Louis, and is locating stations in other parts of the country. The variation as well as intensity of the magnetic force is determined by means of a tabular magnet, horizontally poised on a stirrup, which is suspended by a single cocoon fibre in line with the optic axis of the theodolite, to which a magnetometer box is clamped; the optic arrangement on a position sideways is perceived on the scale of the magnet. This is effected by having a microscopic scale at one end, placed in the focus of a lens at the other end of the magnet, causing all the rays of a mark to proceed parallel, but at an angle with the parallel rays of every one respectively. The angle or "dip" of inclination is found by placing the axles of a delicate magnetic needle upon polished agate supporters, approximately in the center of the graduated vertical or "dip" circle, and in the magnetic meridian. In order to remove eccentricities of axis, imperfections and irregularities in the distribution of magnetism, etc., two different needles are used, and both read with direct and reversed magnetism, and with reversed axles as well as reversed circle, making sixty-four readings on record in all. This gives a very precise means, by eliminating all the inevitable inequalities or instrumental imperfections. The Smithsonian Institute will publish the results of these surveys for the general benefit of the community.

Lima and Oroya Railway in Peru.

This road, which is to master the altitudes of the Andean chain, is building for 27,000,000 reals, by Henry L. Meiggs. Commencing at Callao, on the coast, it will cross an altitude of over 15,000 feet, and terminate at Oroya, 12,200 feet above the ocean. The center of supplies is at Yauli, at 14,000 feet altitude. Grading has been finished 18 miles, and the work of tunneling the crest of the Andes has begun from both ends, with 1,400 Inca Indians engaged on it. The tunnel will be 3,000 feet long, and elevated higher than the summit of Mont Blanc. It is distant from the western terminus on the Pacific only 60 miles. The gradient for the railroad is 211 feet per mile—called there a four per cent grade. Forty miles from Callao, it has been necessary to resort to a V—a turntable and switch, where the railroad takes an up grade in reverse direction for several miles, and again returns, forming almost a figure 8. The mule trail, by which materials are carried over, passes an altitude of 16,500 feet, amid a cluster of peaks covered with perpetual snow. It is hoped by this road to develop the silver wealth of the Cordilleras. With the exception of some coal, rudely taken out and transported on the backs of llamas, at $25 per tun, nothing can be obtained for fuel except dried turf, "buffalo chips," (25 cents a sack), and dried llama dung. Such items will enable those unacquainted with the country to appreciate the fact that this work is one of the greatest events of the age.

Nitro-Ethan—A New Substance.

By the action of ethylic iodide upon argentic nitrite, Meyer and Stuber have obtained a new substance isomeric with ethylic nitrite. When ethylic iodide is poured upon argentic nitrite, violent ebullition ensues. To complete the reaction, the mixture may be heated for some hours with a reversed condenser. On distillation, a mixture of ethylic iodide and nitrite passes over at first; afterward the new substance, which boils at 111° or 113° C. The authors give this body the name of nitro-ethan. It is a perfectly colorless clear liquid of a peculiar agreeable, etherial odor. Its density at 13° C. is 1·0582 (taken with reference to water at the same temperature;) it is insoluble in water, does not explode on heating, and burns with a pale flame. When nitro-ethan is heated with iron filings and acetic acid, a violent reaction ensues, which must be moderated by plunging the flask into cold water so that the liquid does not boil. On subsequent distillation with caustic potash, ethylamin passes over, in large quantity and in a state of great purity. Hence it appears that nitro-ethan corresponds to the aromatic nitro-compounds. A solution of caustic potash dissolves nitro-ethan which appears to possess weak acid properties. Sodium attacks it with evolution of gas and formation of a white powder, which explodes on heating.

Intelligent Monkeys.

Professor Cope describes a monkey in his possession. He is an admirable catcher, seldom missing anything, from a large brush to a grain, using two hands or one. His cage door is fastened by two hooks, and these are kept in their places by nails driven in behind them. He generally finds means sooner or later to draw out the nails, unhook the hooks and get free. He then occupies himself in breaking up various objects and examining their interior appearances, no doubt in search of food. To prevent his escape, Professor Cope fastened him by a strap to the side of the cage, but he soon untied the knot, and then relieved himself of he strap by cutting and drawing out the threads that held the flap for the buckle. He then used the strap in a novel way. He was accustomed to catch his food (bread, potatoes, fruit, etc.,) with his hands, when thrown to him. Sometimes the pieces fell short three or four feet. One day he seized his strap and began to throw it at the food, retaining his hold of one end. He took pretty correct aim, and finally drew the pieces to within reach of his hand. This performance he constantly repeats, hooking and pulling the articles to him in turns and loops of the strap. Sometimes he loses his hold of the strap. If the poker is handed him, he uses that with some skill, for the recovery of the strap. When this is drawn in, he secures his food as before. Here is an act of intelligence which must have been originated by some monkey, since no lower or ancestral type of mammals possess the hands necessary for its accomplishment. Whether originated by Jack, or by some ancestor of the forest who used vines for the same purpose, cannot be readily ascertained.

After a punishment, the animal would only exert himself in this way when not watched; as soon as a eye was directed to him, he would cease. In this he displayed distrust. He also usually exhibited the disposition to accumulate to be quite superior to hunger. Thus he always appropriated all the food within reach before beginning to eat. When different pieces were offered to him, he transferred the first to his hind feet to make room for more; then filled his mouth and hands, and concealed portions behind him. With a large piece in his hands, he would pick the hand of his master clean before using his own, which he was sure of.

Photographs of the Freckled.

Concerning the photographing of freckled or discolored faces, so as to hide such blemishes: while bromised collodion may be a very excellent thing, there is something else that ought to have a place in the dressing room attached to every studio. I allude not to the puff box, but to a kind of white liquid cosmetic much used by the fair sex when dressing for the opera, a ball, or an evening party. I was on one occasion asked by a lady friend to examine some of this cosmetic in order to say how it could be prepared. I made a mixture of a very similar kind by rubbing up a little oxide of zinc with glycerin, and thinning it with rose water until it was of a creamy consistency. I know of nothing better that this for applying to a lady's face previous to photographing her; for, when properly applied by means of a bit of sponge, it leaves the face of a delicate white color, and masks the freckles and other discolorations. Its value will be properly appreciated if a portrait of a lady with well developed freckles be taken first with the face in its natural state, and again after the sponge, moistened with the above cosmetic, has been passed all over it.—*British Journal of Photography.*

Snuff Dipping Factory Girls.

The Lowell (Mass.) *Courier* says: "There is a good deal of snuff dipping going on in Lowell, especially amoog one class of our mill operatives. A woman, who called at a house where several of these girls lived the other night, found the occupants sitting around the room with rags saturated with snuff, which were occasionally rubbed on the teeth and gums, and seemed to produce a kind of exhilaration or subdued intoxication. The visitor was socially offered a rag, but she declined. It is said that the 'dipping' may be seen at some places in the mills, and snuff selling is an important branch of business with some traders." This practice has long been known to exist in the large manufacturing cities in England, and in Lawrence, Lowell, and Fall River, it has been introduced principally by the foreign hands.

ALDOL.—Wurtz has obtained a new polymer of aldehyde having the formula $C_4 H_8 O_2$, to which he gives the name of aldol. It is a perfectly colorless liquid, which after cooling becomes thick like a pure solution of sugar. It is so viscid at 0° that the tube containing it may be inverted without any flow of liquid. When gently heated, it becomes as fluid as water, but it regains its viscid character only some hours after cooling. Its density at 0° is 1·1208: it has a strong aromatic and bitter taste, and mixes in all proportions with water and alcohol. When heated to 135°, aldol is resolved into crotonic aldehyde and water.

THE Panama *Star and Herald* records the first arrival, on April 2, at Panama, on its annual eastern migration, of the beautiful sphinx moth (*Urania leilus*). The immense flights of this moth, and the extreme regularity of their recurrence year by year, have repeatedly been dwelt upon by the *Star*, and much interest has been excited as to its starting place and ultimate destination.

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RECIPES AND EXPERIMENTS.

The following recipes and experiments have not been practically tested by the edi or of the SCIENTIFIC AMERICAN, but are published for the benefit of readers who may desire to try them. The editor would be glad to be informed of the results of such trials.

A NEW HYGROMETER made by G. Smith, in Paris, consists of strips of paper dipped in a cobalt salt solution containing common salt and gum arabic. In dry weather, it is blue, and in wet, rose red.

NONINFLAMMABLE FABRICS.—Carteron and Rimmel have taken out a patent in England for the use of acetate of lime and chloride of calcium for rendering goods non combustible. Equal weights of each are dissolved in twice their weight of hot water.

AN ECONOMICAL FIRE KINDLING is made in Paris by dipping corn cobs in a mixture of melted resin and tar, and drying at 100° C.

PURE AMMONFA GAS is obtained by adding 2 parts caustic potassa to one part liquid caustic ammonia.

A PROTECTIVE VARNISH for zincography is made by melting together equal parts of asphalt, wax and resin, and dissolving the mass in hot oil of turpentine.

TO PREVENT GLUE BECOMING SOUR AND MOLDY.—The addition of a quantity of carbolate of soda, just sufficient to give a strong smell to the glue, will accomplish the desired result.

LIQUID INDIA INK.—Dissolve the powdered ink in hot water and, when deep black, add one tenth its volume of glycerin, and shake well together.

ANTIDOTES TO CARBOLIC ACID.—Fatty oil, wood oil and almond oil are recommended by Dr. G. Calvert. Dr. Husemann advises the use of saccharate of lime, made by dissolving 16 parts of loaf sugar in 40 parts of water, adding to this 5 parts good slaked lime, digesting the mixture with frequent stirring for three days, filtering and evaporating the filtrate to dryness at 100° C.

TO CLEAN GOLD CHAINS.—Put the chain in a small glass bottle, with warm water, a little tooth powder, and some soap. Cork the bottle, and shake it for a minute violently. The friction against the glass polishes the gold and the soap and chalk extract every particle of grease and dirt from the interstices of a chain of the most intricate pattern; rinse it in clear cold water, wipe with a towel, and the polish will surprise you.

A USEFUL HINT.—By rubbing chalk on the side of a carpenter's square, the figures may be more readily seen. Near sighted persons will do well to remember this.

ELECTRICITY is developed in metallic wires by merely bending them, and the development appears to be independent of any thermic action.

TO MEND RUBBER OR OTHER HOSE.—Cut the hose apart where it is defective; obtain a piece of iron pipe, ten or twelve inches long; twist the hose over it until the ends meet, and wrap with strong twine, well waxed.

BORAX.—One half a pound will drive the cockroaches out of any house. A large handful of the powder to ten gallons of water will effect a saving of fifty per cent in soap. It is an excellent dentifrice and the best material for cleansing the scalp.

TO MAKE OLD BUTTER FRESH.—Knead with lime water or a very diluted solution of washing soda. Simply washing in water is often perfectly efficacious.

TO BRONZE BRASS OBJECTS.—First warm them, and then wash over with a hot solution of ammonium chloride (sal ammoniac), then place over night in a diluted solution of two parts verdigris and one part ammonium chloride in six parts of vinegar. In the morning, remove and wash.

TO EMPTY LARGE BOTTLES OF LIQUID.—By imparting a motion of rotation to the contents of an inverted bottle, the water or other liquid will issue in the form of a tube, the air entering up the center without impeding its passage. The bottle can thus be emptied in one half the usual time.

ARTIFICIAL PARCHMENT.—The Germans are applying the paper tissue known as artificial parchment for the manufacture of artificial sausage skins—a novel but highly characteristic idea. This membrane is rather indigestible.

LACING FOR SEWING MACHINE BELTS.—An old kid glove makes excellent lacing for securing small belts on sewing and other machines. Cut the gloves into strips half an inch wide, and roll them up tight.

TO JAPAN OLD TEA TRAYS.—First clean them thoroughly with soap and water and a little rottenstone; then dry them by wiping and exposure at the fire. Now get some good copal varnish, mix with it some bronze powder, and apply with a brush to the denuded parts. After which, set the tea tray in an oven at a heat of from 212° to 300° until the varnish is dry. Two coats will make it equal to new.

ALLOY FOR JOURNAL BOXES.—24 pounds of copper, 24 pounds of tin and 8 pounds of antimony. Melt the copper first, then add the tin and lastly the antimony. It should be first run into ingots, then melted and cast in the form required for the boxes.

THE Academy of Sciences in Bologna has announced that a prize of 1,200 *lire* ($240), the "Aldini Prize," will be awarded to the author of the best scientific experimental essay on galvanism or dynamic electricity. Essays intended for the competition must be sent in between July 1, 1872, and June 30, 1874, and must be written in Italian, Latin, or French. They must be either written or printed; but, in the latter case, must not have been published previously to the two years above mentioned. Each essay is to bear a motto, and to be accompanied with an envelope stating the name of the author. They must be addressed to the Perpetual Secretary of the Academy of Sciences of the Bologna Institution.

Service upon Atlantic Cable Business.

If there is one thing more surprising than the fact that it is possible to transmit intelligence beneath the waters of the broad Atlantic, it is the celerity with which that business is performed. In the average time upon each message transmitted between New York and London, the service is barely equaled by the best managed circuits wholly upon the land. For the seven days ending July 20, 1872, the actual time averaged upon messages exchanged between New York and London was 13 minutes and 59½ seconds. That is to say that a telegram addressed to London, leaving New York at 9 A. M, New York time, reached its destination at a fraction less than 9:14 of same time. When the distance is considered, the fact that the message has to be rewritten four times—at Plaister Cove, Heart's Content, Valentia, and London, and that this is the average upon the whole business for the week, and not the time upon any one message—it speaks volumes for the business management and the skill of the operators engaged.

That the average time of this week was not exceptional, we have ample proof upon the examination of the record.

An exact record is kept of every message by each of the companies engaged in its transmission, the precise time of its reception at each office is taken, and from this a daily and a weekly average is made. In this average, press and government despatches are included, which from their much greater length than ordinary business messages, serve to place the average time somewhat greater than is really occupied in the transmission of business for the general public.

Messages between New York and London pass over the wires of four Companies—the Western Union, to Plaister Cove; the New York, Newfoundland and London, from Plaister Cove to Heart's Content; the Anglo American from Heart's Content to Valentia, and from Valentia to London, by the British lines.

On one of the seven days given above, the average time of transmission between New York and London was actually only six minutes and thirty-five seconds; and the shortest average time for messages for the entire day over one of the four lines was one minute and four seconds.

It is difficult to see wherein this service can be improved, and yet efforts are being made to that end. Mr. H. H. Ward, Superintendent of the New York, Newfoundland and London Telegraph Company, and Mr. Stearns, the inventor of the improved duplex instrument, have left for Plaister Cove and Heart's Content to introduce the double transmitter upon the wires between those points, and the Western Union Company have under consideration the advisability of placing them upon the circuits between New York and Plaister Cove, and also to place Heart's Content in direct communication with New York, thus avoiding one rewriting. When these improvements take place, the average time of transmission between New York and London will be reduced to a minimum. —*Journal of the Telegraph.*

The Cloud Burst.

Many persons confound the waterspout with what is commonly known as the cloud burst, yet a moment's consideration will show them the difference. Waterspouts are frequently seen on the ocean or upon the broad lakes, and proceed from a whirlwind gathering the water and whirling it upward in a heavy column to clouds. These can be seen at a long distance, clearly defined, carried in the direction traveled by the wind, and are decidedly dangerous customers to come in contact with. Many a good ship, missing and never more heard from, doubtless has fallen victim to some overwhelming waterspout. It is said that they can be broken at a distance by a lucky cannon shot, but if the spout is broken by the ship itself, sure and speedy destruction must follow. Whirlwinds produce a similar effect on land, and out on the deserts to the east of here are frequently to be seen huge columns of sand thus whirled upward, reaching from the plain to the clouds above. Cloud bursts occur in the summer season during heavy thunderstorms, and are simply rain showers of sudden and extraordinary violence.

Some over-laden cloud sailing over a mountainous locality merely turns its watery contents loose, and it comes streaming down, flooding the hillsides, from whence the water flows in sheets into the ravines. So sudden is the flood that, where not a drop of water has been seen for weeks or months a large turbulent, overwhelming torrent comes pouring down carrying away trees, rocks, and everything else before it, washing away railroads, bridges, toll roads, houses; in fact everything in its way. One of these floods, thus pouring down a steep, dry mountain cañon, frequently shows an advancing front of logs, bushes, huge boulders, and similar *debris*, twelve or fifteen feet high. Woe to any unlucky teamster who happens to be passing with his loaded wagon along the bed of the cañon! Those who understand matters are able to guard against the impending calamity by getting their wagons out of the ravine and up on the hillside as far as possible; or, if they have no time for that, they will unhitch their animals and give them a chance to escape. Instances are known where one of these cloud bursts has occurred on some broad slope where, having no ravine to carry off the water, it has plowed and torn a channel for itself of great depth and extent. This is the proper season of the year for cloud bursts, and as one of greater or lesser magnitude visits Gold Hill or Virginia nearly every season, one may be expected before long.—*Gold Hill (Nevada) News.*

Among the patented contrivances for stopping runaway horses, one consists of a pair of nose stoppers, attached to a bit, and which are closed over the nasal openings of the animal by means of a cord, which the driver pulls if the horse attempts to run. Another consists of a pair of blinders, by which the driver, on pulling a cord, instantly blindfolds the pony.

Hardness of Minerals and Metals.

We say in general that one body is harder than another if it can scratch it. In mineralogy, hardness is an important property, and a scale was established by Mohs, running from one to ten, which is adopted by all writers of the present day. It is as follows:

Talc	1	Felspar	6
Gypsum	2	Quartz	7
Carbonate of lime	3	Topaz	8
Fluor spar	4	Corundum	9
Opatite	5	Diamond	10

We constantly see it said, in scientific works, "the hardness is 6, 7 or 8," and by reference to the above table we at once comprehend the expression. The following list may serve to impress the subject on the mind:

Diamond	10	Turquoise	6
Ruby	9	Lapis lazuli	6
Cymophane	8.5	Felspar	6
Topaz	8	Amphibole	5 5
Spinell	8	Phosphorite	5
Emerald	8	Fluorspar	4
Garnet	7 5	Cœlestine	3 5
Dicroite	7 5	Barytes	3·5
Zircon	7	Carbonate of lime	3
Peridote	7	Mica	2·5
Quartz	7	Gypsum	2
Tourmaline	7	Chlorite	1 5
Opal		Talc	1

The hardness of metals is usually estimated by the resistance offered by wires of equal diameter and same temperature when drawn through a hole of given size. The following is the order in which a few of the metals are ranged:

Steel	100	Iron	42
Iron	88	Platinum	38
Brass	77	Copper	38
Gold	73	Zinc	34
Copper	58	Tin	11
Silver	58	Lead	4

According to Thomson, the order of hardness of metals is as follows: steel, iron, platinum, copper, silver, gold, tin, antimony, lead.—*Journal of Applied Chemistry.*

Auguste Krantz.

We regret, says the *Journal of Applied Chemistry*, to have to record the death of Dr. Auguste Krantz, of Bonn on the Rhine, which took place from an attack of erysipelas, during a visit to Berlin, on the 6th of April last. Dr. Krantz was a scientific merchant in rocks, fossils and minerals, one who not only knew accurately the commercial value of his collections, but was intimately acquainted with the scientific worth of every specimen which passed through his hands. His agents explored every mineral locality in the world; and, by a system of exchanges and the establishment of correspondents, he was able to obtain the choicest specimens from the most remote regions. It has often been remarked by scientific men that in order to obtain a complete suite of the minerals of the United States, it would be necessary to send to Dr. Krantz, in Bonn. There is probably not a museum of any size, in any part of the globe, that is not enriched from his collections. He was, if not the oldest, by far the most extensive, dealer in minerals in the world, and he leaves an immense and valuable collection, both of minerals and fossils, the results of the labors of a long life devoted to their accumulation. No scientific man ever passed through Bonn without going to visit the museum of Dr. Krantz, and every stranger was received with polite attention, although he was often imposed upon by tourists who really had no claims upon his time. He was truly a scientific merchant, and his death will be severely felt at every institution of learning in all parts of the world. We believe it is the intention of Madame Krantz to carry on her husband's business, with which she is well acquainted.

What is Dirt?

Old Dr. Cooper, of South Carolina, used to say to his students: "Don't be afraid of dirt, young gentlemen. What is dirt? Why, nothing at all offensive, when chemically viewed. Rub a little alkali upon the dirty grease spot on your coat, and it undergoes a chemical change and becomes soap; now rub it with a little water and it disappears. It is neither grease, soap, water nor dirt. That is not a very odorous pile of dirt you see yonder; well, scatter a little gypsum over it and it is no longer dirty. Everything like dirt is worthy our notice as students of chemistry. Analyze it; it will separate into very clean elements. Dirt makes corn, corn makes bread and meat, and that makes a very sweet young lady, that I saw one of you kissing last night. So after all, you were kissing dirt, particularly if she whitened her face with chalk or fuller's earth; though I may say that rubbing such stuff upon the beautiful skin of a young lady is a dirty practice. Pearl powder I think is made of bismuth, nothing but dirt. Lord Palmerston's fine definition of dirt is 'matter in the wrong place.' Put it in the right place and we cease to think of it as dirt."

TANNING WITH GLYCERIN.—The property of glycerin to preserve leather has been known for a long time; it is now proposed to employ it in tanning, to increase the elasticity and resistance of the leather. This system of tanning is particularly adapted to straps and belts of machinery, as it keeps them from drying and cracking. It is only necessary to immerse the leather, tanned in the usual manner, in a bath of glycerin, and to leave it for several weeks, when the pores will be impregnated with the greasy substance, and the leather will be found to be much more elastic and tenacious.

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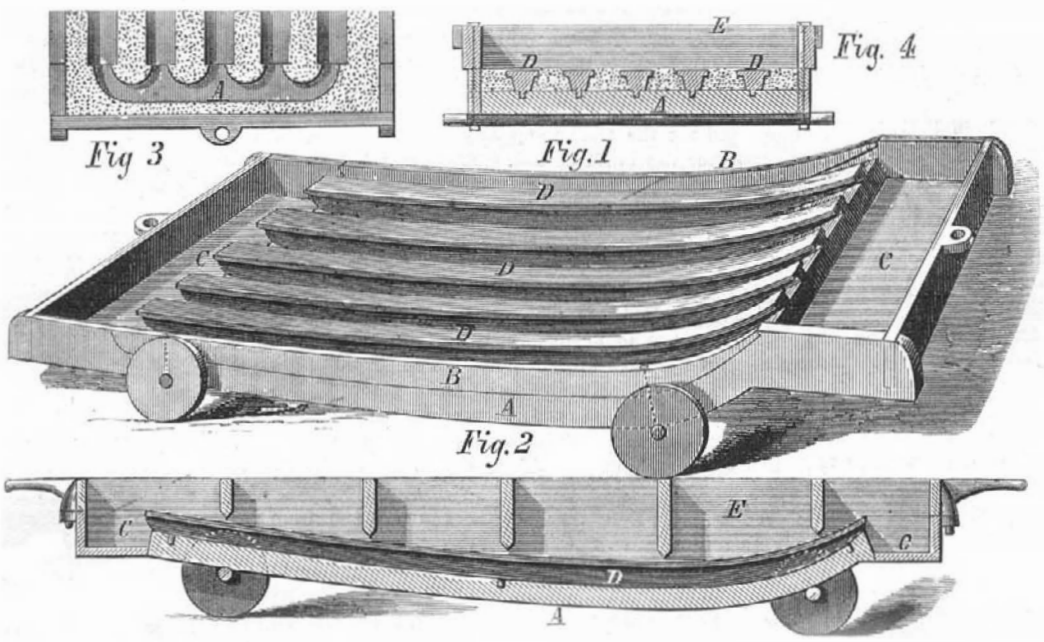
MOLD FOR CASTING AND CHILLING SLEIGH SHOES.

The improvement now illustrated is designed to save the time and expense involved in grinding and polishing sleigh shoes, by giving them smooth and hard faces in the casting, without, at the same time, materially injuring their strength or incurring liability to loss in the process.

A, in the figures, is the lower part or nowel of the flask. the bed of which is cast in one piece and of a shape to conform to the face of the shoe intended to be cast. The sides, B, are cast separate and are fastened to the bed by means of bolts. The ends, C, are made detachable, being hooked on to the bed casting in the manner shown in Fig. 1. This is doue to preserve the flasks, as, if they are made in one piece with the bed, they are apt to crack off. At D are shown the patterns, which are placed upon the bed of the nowel and kept in place by dowels. The latter serve also the purpose of core prints. When sand has been placed in the nowel, as seen in cross section in Fig. 4, and the patterns have been withdrawn, a connecting chamber is formed at one end thereof, in the manner shown in the plan view, Fig. 3. The cope, E, which is a wooden frame with transverse ribs, and which is provided with handles at its ends, is then applied to the top of the nowel, as shown in section in Fig. 2, and the process of casting is carried out. The metal is chilled as it comes in contact with the smooth surface of the bed, and the shoes are withdrawn from the mold ready for service. The nowel is mounted on wheels for convenience in moving it.



BUTMAN'S MOLD FOR CASTING AND CHILLING SLEIGH SHOES.

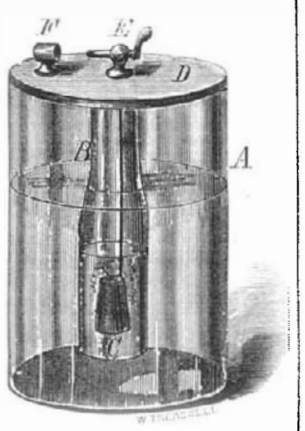
It is claimed that shoes produced in this way are superior to the old ones and command a higher price, while there is a saving attending the use of the new mold.

Patented through the Scientific American Patent Agency for Volney A. Butman, of Ironton, Wis., June 11, 1872. Further information may be had by addressing V. L. Benjamin, Fond du Lac, Wis.

HOW TO MAKE A CHEAP HYDROGEN LAMP.

The principle on which the hydrogen lamp is based is the property of platinum sponge to absorb large quantities of oxygen, so that, when a jet of hydrogen is directed upon it, a rapid combination of the gases ensues, attended by the evolution of intense heat and faint light. The lamp is useful not as a means of illumination but for supplying the place of matches, or other means of obtaining fire whenever a quick light is required.

Our figure represents the ordinary form of construction. A is a glass vase, B a bottomless glass vessel attached to the metal cover D, C is a cylindrical piece of zinc suspended by a wire from the cover, E is a stop cock kept closed by a spring and readily opened by the pressure of the finger. F is a metal capsule, in which is placed a small portion of platinum sponge. To set the instrument in operation, a weak solution of sulphuric acid and water is poured into A. This attacks the zinc, causing hydrogen gas to be evolved, which fills the space in B and forces out the water. The stop cock should be kept open until the atmospheric air is entirely out of the receptacle. As soon as the pure hydrogen issues, the jet should be directed upon the platinum sponge, which will immediately become incandescent and ignite the hydrogen which will burn with a pale blue flame. When the hydrogen in B is exhausted, the light will be extinguished, the solution in the outer jar will again enter to its proper level, again attacking the zinc, when the same process will be repeated. Such a lamp will remain in working order until the power of the acid is exhausted or the zinc destroyed. It generally stays in good condition, giving fire immediately, for from two to three weeks.



As we have lately received several queries of how to construct this lamp cheaply, we add the following method, the materials being the least expensive and the easiest attainable that we can suggest. The outer vase may be made from a good sized preserve jar by cutting off the upper portion by means of a woolen string moistened with turpentine. For the inner tube, B, an ordinary lamp chimney will answer. The cover, D, can be made from sheet brass and the chimney attached to it by some good cement. The stop cock can be turned by a metal worker, from whom also the piece of zinc may be obtained; or the pewter cock from the top of a seltzer or mineral water flask, that can be readily bought from any druggist, may be employed, bending the tube, used for the exit of the water, straight and reducing its orifice to a very small hole. An empty metallic cartridge case will do for F. The platinum sponge can be purchased from any dealer in chemicals at a small cost. The proportions of water and acid used are about one ounce of the acid to a pint of water.

New Sugar Dryer.

C. H. Hersey, of South Boston, Mass., is the inventor of a new machine for drying sugar and other substances, which is said to be simple and effective. The machine consists of an outer cylinder from five to six feet in diameter and twenty-five feet long, inside of which is a steam cylinder about three feet in diameter and twenty feet long. The sugar is carried around in the outer cylinder by ledges on the inside of the cylinder, and is dropped in a continuous shower upon the outside of the steam cylinder, both cylinders being connected together and revolving at the same time; the sugar slides off the heating cylinder hot, and is thus dried. The machine stands inclined slightly, so that the sugar going in at one end is gradually worked forward to the other, where it falls into a revolving screen, which separates it into the various grades of coarse and fine sugar. The capacity of the machine exceeds thirty barrels per hour.

LAW'S SHUTTLE BINDER.

The invention we illustrate in the annexed engravings consists in an improved method of actuating the mechanism by which shuttle binders are operated.

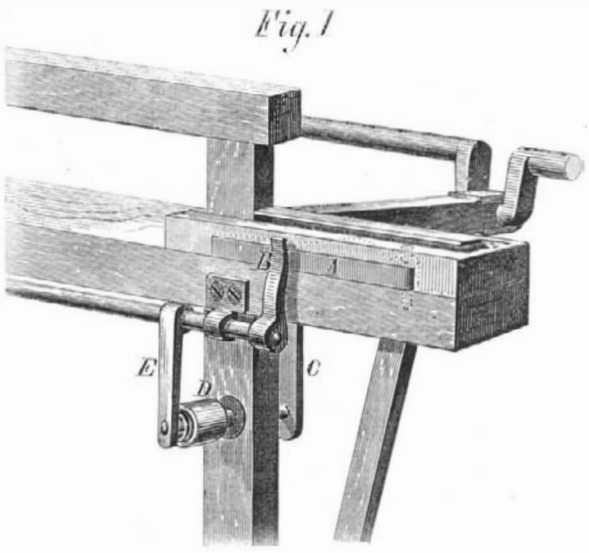
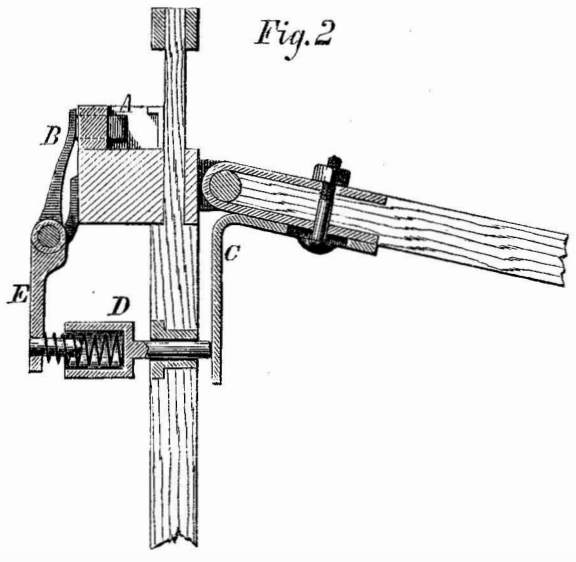


Fig. 1 represents a portion of the lathe of a loom, showing part of one sword, one rod connecting the lathe with the crank, and the device attached. Fig. 2 is a detail sectional view of the same.



The shuttle boxes are situated at the ends of the lathe beam and the shuttle binding levers, A, are pivoted in the sides of the boxes in the ordinary way. The protecting rod is provided with arms for operating the levers, shown at B, as in other looms. For producing the proper motion in this rod, the inventor provides the following simple and ingenious arrangement:

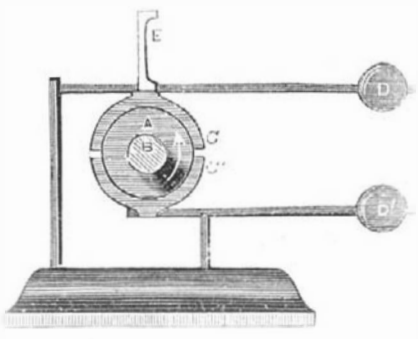
The arm, C, is attached in the manner shown in Fig. 2 to one of the rods which connect with the cranks; in a hole made through the opposite sword is placed the pusher, D, and to the protecting rod is affixed the arm, E. A spiral spring is connected at one end with E, and the other end is carried by the socket of the pusher, D, as delineated in Fig. 2. The device is brought into action by the downward movement of the crank, which takes place at the same time that the shuttle is driven into one of the boxes. This downward movement forces the arm, C, against the pusher, D, which presses outward, with a yielding pressure, the arm, E; the effect of which is to force the upper arms of the rod, B, against the binding levers, A, and thereby retain the shuttle in whichever of the boxes it may happen to be in, until the crank rises enough to carry the arm, C, away from the pusher. As soon as this occurs, the device ceases to operate, and the rod is turned by a spring (which may be seen in Fig. 2) so as to throw the arms, B, away from the levers, A, and release the shuttle just in time for it to be thrown.

The inventor claims that with this binder the shuttle is prevented flying out of, or turning in, the box and the cops do not break on the shuttle spindle. It renders needless the usual springs on the binding levers, and effects saving in power and supplies, while its own first cost is a mere trifle.

Patented through the Scientific American Patent Agency, June 11, 1872, by Mr. Henry H. Law, of Gloucester, Camden Co., N. J of whom further information may be obtained.

Apparatus for Testing Lubricators.

A is a friction drum or pulley of cast iron, about 3 inches diameter, keyed on a shaft B. C and C′ are two clips or saddles of brass, each extending nearly half round the circumference of the drum, and pressed to it with a constant pressure by means of the two weighted levers, D D′. E is a thermometer fixed on the top saddle or clip C, and serves to indicate the heat caused by the friction of the drum revolving between the two saddles, C C′. The method of using is as follows: The shaft, B, and pulley, A, are made to revolve at a speed of 1,800 or 2,000 revolutions per minute, the number of revolutions being shown by a counting machine indicating up to one million, but which is not shown on the sketch to avoid complication. It will be evident that this velocity, continued several minutes, will generate considerable heat, and that this heat is raised by a less number of revolutions when a bad oil is used than when an oil of superior lubricating power is used. For instance, if it requires 50 revolutions to raise 1 degree of heat in one oil, and 100 revolutions



in another, it is evident that the quality of the first will only be half as good as the second. Before starting the machine, the temperature at which the thermometer stands is noted; this, of course, will be the temperature of the room or workshop. A portion of the oil or grease to be tested is poured or smeared on the friction pulley, and the saddles, with their weighted levers, allowed to press on the drum. The machine is then started and allowed to run till the thermometer indicates a temperature of 200° Fah. When it is stopped, and the number of revolutions it has made is taken from the "counter," then the number of revolutions, divided by the number of degrees of heat that the thermometer has been raised, will show its lubricating power. After the first trial, the machine is allowed to rest twenty four hours, and then it is started again without adding any more oil, and without breaking the contact of the saddles with the drum. The number of revolutions of the drum is again taken, and divided by the number of degrees of heat raised in this second trial; and if the result is not more than from 10 to 20 per cent less than the first trial, the oil may be considered good. In very bad oils, the saddles are found to be so fast glued to the drum that the machine cannot be started a second time, and in some cases it requires considerable force to break the contact or adhesion between the drum and the brass saddles.

This apparatus is the design of Jno. Bailey & Co., of England, and is said to operate extremely well.

AT the recent exhibition of the Royal Agricultural Society, England, some of the portable farm steam engines were fitted with the electrical indicator which shows upon a dial the temperature of the water contained in the boiler.

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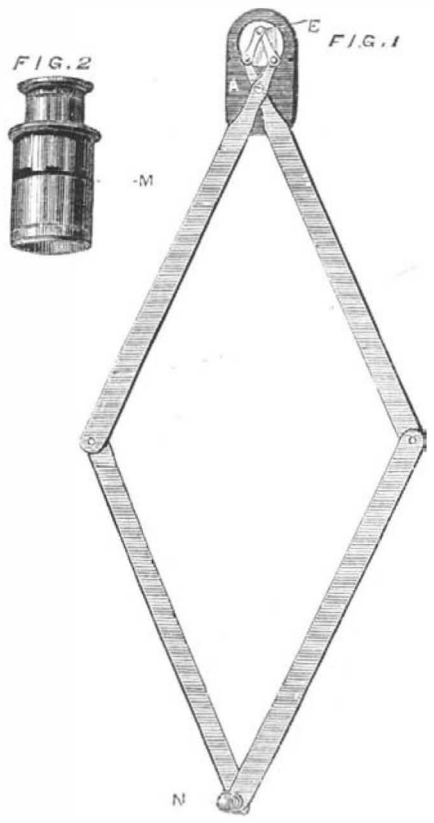
Copying from the Microscope.

One of the latest inventions for rendering the copying of an object as seen in the microscope both accurate and easy was recently described, by Mr. Isaac Roberts, F. G. S., to the Royal Microscopical Society, and an illustration was published in their *Journal*. The instrument consists essentially of two parallelograms, having their major and minor sides and angles respectively proportioned in all positions in which the instrument can be placed. The major and minor sides rotate freely about the common center or fulcrum, which is fixed to the eyepiece of the microscope in the focus of the eye-lens. A pencil is attached to the major end joint of the instrument, and a small glass disk, ruled with a micrometer-lined cross, is attached to the minor, or eyepiece, end joint, in the position where pointers are placed. To see both cross and object at the same time, similar focussing is necessary to that which is employed to see an object and a pointer. When drawing, the hand merely moves a pencil over the paper, and at the same time and by the same action guides the micrometer cross lines over the field where the object appears in the microscope. The drawing paper



should, of course, be laid on an inclined table capable of adjustment to the hight of the microscope employed, the top being also made movable to suit the angle at which the micro cope is being used. In the illustration Fig. 1 represents the micro-pantograph, and Fig. 2 the form and approximate position of the slit into which the minor end of the micropan tograph and its support, shown at the top of Fig. 1, are inserted. In Fig. 1, E is a glass disk with micrometer cross lines ruled upon it. It is cemented over a small hole drilled through the center of the rivet forming the joint of the minor extremity. A is a center, or fulcrum, around which the parts of the instrument freely move. N is a holder for a drawing pencil, placed over a hole drilled through the rivet forming the joint of the major end of the instrument. In Fig. 2, M s a slit for the insertion of the minor end of the micro-pantogra h, with its support shown behind E A in Fig 1. The instrument being firmly fixed in position in the eyepiece to draw any object, it is only necessary to place the eyepiece in the microscope, adjust the drawing table to the hight and inclination of the plane of the pantograph, and with the right hand forefinger and thumb guide the pencil with slight pressure over the paper, at the same time looking through the eyepiece at the object and guiding the center of the micrometer cross lines over the respective parts of it; an accurate drawing of the object will thus be traced upon the paper. For those, however, who may desire to make for themselves, it is only necessary to say that the the length of the minor sides of the parallelogram within the eyepiece is ½ inch; of the major sides 5¾ inches, the instrument when extended to the full length measuring 12¼ inches

Fool's Gold and How we may Know it.

The following story is going the rounds of the papers, and would be decidedly rich if it were only true:

A verdant looking Vermonter appeared at the office of a chemist with a large bundle in a yellow bandanna, and opening it exclaimed: "There, doctor, look at that." "Well," said the doctor, "I see it." "What do you call that, doctor?" "I call it iron pyrites." "What, isn't that gold?" "No," said the doctor, and putting some over the fire, it evaporated up the chimney. "Well," said the poor fellow with a woebegone look, "there's a widder woman up in our town has a whole hill of that, and I've been and married her!"

That the poor fellow had married the widow for the sake of the hill of pyrites is very probably true, but that the pyrites evaporated up the chimney is simply impossible, and such a statement is to be regretted because the inexperienced may be led to believe that, if a bright, yellow metallic looking mineral does not evaporate when strongly heated, it must be gold. There are several minerals which are sometimes mistaken for gold, but the two which are most apt to give rise to deception in this matter are pyrites and mica, and hence they are sometimes called fool's gold. The method of distinguishing between them and gold is very simple, and requires no complicated apparatus. Gold is malleable, that is, it can be beaten out into thin leaves under the hammer, while the others crumble to powder. Moreover, gold is easily cut with a knife, while if we attempt to cut pyrites it breaks up, and mica separates into thin flakes. It is when mica is in fine powder, however, that it most resembles gold, and in such cases, its weight betrays its character. Gold is nearly twice as heavy as lead, and, even by poising it in the hand, we can tell that lead is much heavier than mica.

Estimation of Sulphur in Organic Compounds.

Chemists have always experienced more or less difficulty in ascertaining, with exactitude, the amount of sulphur contained in organic compounds, the usual methods and agents employed for that purpose being slow and uncertain in results. W. S. Mixter, of the Yale Scientific School, has devised an effective apparatus by which he burns the sulphurous substances in oxygen and condenses the sulphur in the form of sulphuric acid. This method presents an easy method of effecting the separation and permits the estimation of the sulphur with much exactness.

The following results, obtained by the author, in the order they are given, shows the applicability of the method, while some of the details mentioned may help to explain the use of the apparatus.

	Weight taken.	Per cent found.
1. Iron pyrites (mixed with carbon)	0·0658	51·20
2. " "	0·0597	51·26
3. Sulphur	0·2070	99·76
4. "	0·2807	99 92
5. "	0 4951	99·93
6. "	0·5882	100 02
7. Carbon disulphide	0·7725	84·12
8. " "	0 4598	84 16
9. Bituminous coal	0·6640	2·97
10. " "	0·7860	2 99
11. Wool	0·4640	3 44
12. "	0·4675	3·46
13. Tobacco	2 0720	0·37
14. "	2 1370	0·36

Manufacture of Envelopes.

One of the most interesting mechanical novelties to be seen at the International Exhibition in London, is the envelope machine of Fenner and Co. of that city. All the manual labor, that is required in attending to the machine, is limited to the supply from time to time of a pile of envelope blanks, and the occasional removal and banding of the finished envelopes. Thus the entire and various processes, of feeding, gumming, stamping, folding, delivery, and collection, are performed automatically by a series of mechanical operations devised with the utmost ingenuity and carried out in perfection; the machine withal being excessively compact and well arranged.

The pile of envelope blanks being placed in position on a plate at one end of the machine, which may be done either at rest or in motion, the feeding process is effected by the simple aid of intermittent suction. An elastic tube has a trumpet-shaped brass mouthpiece which descends on the uppermost blank, and at the moment of contact the air is exhausted by a stroke of the air pump, when the mouthpiece rises with the blank attached, the suction being maintained just sufficiently long to enable the arm and grippers, rapidly projected from the other side of the machine, to seize the blank, when the attachment to the mouthpiece ceases and the arm shoots back, drawing the blank into position over the folding box and there rapidly releasing it. At this moment, the stamping is effected by the action of a hammer and die, and the gum is applied in due place on the edges of the side flaps, whereupon a plunger head, of the rectangular form and size of the envelope, descends, carrying the blank down into the folding box; the flaps, thus raised into a vertical position, are then enclosed and folded down in proper sequence by slides working in the thickness of the folding box; and finally the bottom of the box rises and completes the operation by pressing the whole against the slides, so that the edges are made sharp and the adhesion is effected and secured. The slides are then withdrawn, and the bottom of the folding box drops, allowing the envelope to drop in a vertical position into the delivery trough underneath, running across the machine, wherein, by a simple contrivance and combination of guides, holders, and pressers, the envelopes as they drop from the folding box are successively, uniformly, and regularly arranged, and worked along the trough ready for removal and banding by the attendant.

These manifold operations are successively and successfully wrought with such speed, and almost simultaneity, that the finished envelopes are turned out complete at the rate of 50 per minute or 3,000 per hour.

A New Quicksilver Ore.

Professor J. D. Whitney has discovered a new ore of mercury in California, which, according to an analysis made by G E Moore, consists of sulphide of mercury 98 92 per cent, sulphide of iron 0·83 and quartz 0·25; its color is black, streak black, specific gravity 7·70, and no trace of crystallization. It appears to be identical with the amorphous modifications of sulphide of mercury. It is proposed to call it *meta-cinnabar*. The associated minerals are usually copper and iron pyrites, and a few crystals of cinnabar. The occurrence of the cinnabar has hitherto escaped notice, as it has been mistaken for black cinnabar, from which it differs, however, in the absence of crystalline form, in its black streak and lighter specific gravity. It promises to become an important ore in the quicksilver mines of California and some of the other Western States.

Correspondence.

The Editors are not responsible for the opinions expressed by their Correspondents.

Force of Falling Bodies.

To the Editor of the Scientific American:

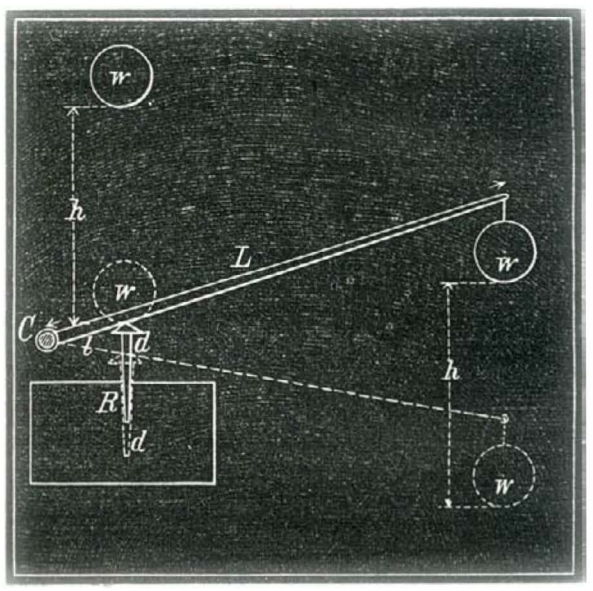
The question "With what force does a falling body strike?" has been frequently repeated in the SCIENTIFIC AMERICAN for the last 25 years, and has generally been answered by the batch of dynamical terms used in colleges and styled "scientific." The answers have invariably made the problem more obscure. Each one generally says that "the problem is very simple," and he pretends to understand the subject perfectly. I am one of those pretenders, and propose to answer the question in my own way, reference being made to the accompanying figure.

Let us assume the case of driving a nail into a piece of wood by the aid of a lever whose fulcrum is at *C*. The applied force is represented by the weight, *w*, acting on the lever, L. Let R denote the force of resistance in the wood, expressed by the same unit of weight as that of *w*, say pounds.

The weight, *w*, acts on the long lever, *L*, and the resistance, *R*, on the short lever, *l*. Then

$$R : w = L : l, \text{ and } R = \frac{wL}{l}$$

That is to say, the force of resistance in the wood is to the weight or force, *w*, as the long lever, L, is to the short lever, *l*.



Let *h* represent the vertical hight which the weight, *w*, moved, and *d* the distance which the nail was driven into the wood. Then

$$R \cdot w = h : d, \text{ and } R = \frac{wh}{d}$$

That is to say: the force of resistance in the wood is to the force or weight, *w*, as the hight, *h*, is to the distance *d*.

Now let the same weight, *w*, fall from an equal hight, *h*, directly upon the head of the nail, and the latter will be driven into the wood the same distance as by the aid of the lever. Therefore: the force with which the falling body acted upon the nail is to the weight of the falling body as the hight of fall is to the distance the nail is driven into the wood. The force of the falling body is equal to its weight multiplied by its hight of fall, and the product divided by the distance which the nail is driven into the wood.

JOHN W. NYSTROM.

Philadelphia, Pa.

Fast Small Side Wheel Steamers.

To the Editor of the Scientific American:

I have read J. A. G.'s communication entitled "Small Fast Steam Propellers Again," in your issue of August 10, 1872, with much interest, for the reason that J. A. G.'s first communication was shown to a gentleman of our city, who wished just such a boat to solicit his various customers living on the many navigable waters of the West. After giving the subject some attention, he arrived at the conclusion that a propeller would not answer his purpose, as he desired an extraordinarily fast and light steamer; hence he contracted with the well known hull builder, Mr. D. S. Barmore, of Jeffersonville, Ind., for a hull of the following dimensions: Length 70 feet, beam 15 feet, depth of hold, 3 feet; of an easy model, but with displacing lines very full just above light water line, so that, in going very fast, she would not bury.

This hull is propelled by two side wheels placed amidships, with outer ends of shaft inclined aft ten degrees on a parallel line with keel. The wheels are 12 feet in diameter and with 6 feet buckets, the bucket blades or paddles being corrugated, and a right angled face riveted on to make them have an additional hold on the water, as the angle plate will prevent a splash of water to the center of the wheel. Each wheel is driven by a separate engine, each 10 inches × 36 inches. Balanced oscillating slide valves are used. The boiler is my own patent, and as I have "boiler on the brain," I do not want a very large gratuitous advertisement, but would modestly say: It is a wrought iron sectional safety boiler, the firebox enclosed with tubes filled with water, the same as used on my portable and traction engines; in some respects, it resembles a Root boiler.

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The machinery of the steamer is now being made by Messrs. F. Warren & Co., Louisville, Ky., and the boat will be ready on September 1st. The owner has had from various builders and mechanics an estimate of the speed that she will develop; and these estimates have been from 4 to 20 miles per hour. We wish you would give us an opinion of the result that should be obtained when using 120 lb. steam, with engines wide open; you have a fair chance to be a prophet, as many expert mechanics and prominent men have been invited to accompany her on her trial trip, which will be made during the Louisville exposition. Should she perform well, a second trial may be made to Cincinnati.

Her builders contract to make but 9 miles against the current of the Ohio river, and she will trim up upon 16 inches with water in the boilers. MIRCLEAN N. LYNN.

New Albany, Ind.

Steam Engineering in the Mahoning and Shenango Valleys.

To the Editor of the Scientific American:

The valleys of Mahoning and Shenango are situated about 15 miles apart, the former being in the county of the same name in the State of Ohio, and the latter in Lawrence county, Pennsylvania. Both valleys are largely occupied by iron works and coal mines, there being 40 blast furnaces and rolling mills in operation, and coal mines large in number and extent. In the iron works, engines from 10 to 500 horse power are in use, all on the high pressure principle, the poppet valve system being in great repute. This form is much used on steam boats on the Ohio and Mississippi rivers. The boilers generally approved in these districts are cylindrical in shape, of the double return flue design; the diameters range from 30 to 42 inches, and the lengths from 22 to over 40 feet. The thickness of the plates generally used is three sixteenths or one quarter of an inch, the heads of the boilers being five eighths thick. The boilers are generally set up from two to six in a battery, enclosed in a reverberatory furnace; and they are worked at a pressure ranging from 60 to 110 pounds on the inch.

These works, however, are generally in anything but a thriving condition, and the cause is the scarcity of educated engineers, posted in the theory as well as the practice of their profession. But who is to blame for the incompetence of the botches and inexperts? Both the employers and the engineers themselves. The former employ incapable men because of the somewhat higher wages which a properly instructed mechanic rightly demands, although the ultimate expense of this cheaper labor is three times that of doing the work well and efficiently at first. I propose to give an illustration or two of the losses and waste caused by incompetent men, employed under a mistaken notion of economy.

The most obvious loss is in running the engines and machinery. The former soon become out of order; the pistons get to be loose and leaky, the valves are improperly set, so that there is no lead on the exhaust side of the poppet valve engine. The latter fault causes a waste of power which an experienced engineer only can rightly appreciate. Further losses are occasioned by loose pins, journals and bearings, and by the engines being out of line; the slide valves are sometimes very badly fitted at first, and then get more out of shape for want of an occasional facing. External corrosion on boilers is caused by leaky joints, and steam is conveyed long distances in pipes not covered with any non-conducting material. There are many other faults, which are probably in the recollections of such of your readers as have been in an ill-managed engine and boiler house.

I have already stated that the incompetence of the engineers is the cause of this state of things, and I know no other reason for the employment of such men but the before-mentioned one of economy. But as a general thing, our employers do not have much to say to us. I cannot account for this, unless it is owing to an idea that we might not continue to recognize their authority, or that we might ask for higher remuneration if our positions were improved and our knowledge appreciated. But I admit that many of us are such as to justify the indifference of their employers, which, however, leads to the degrading of the man of ability and knowledge to the level of the botch and the inexpert.

It frequently happens that we have to replace an old engine by a new one, and the owner will go to a machine shop and order an engine in some such words as these: "I want you to build us an engine complete, twenty inch cylinder and four feet stroke, with a balanced slide valve," or perhaps, "an engine with a thirty inch cylinder and a six feet stroke with poppet valves." For some shops, an order given in this way might suffice, but generally the shops here in the West cannot properly fill an order on such instructions as these; and the result is a badly built misproportioned engine, of which, however, the owner is seldom competent to detect the faults. I maintain that when an engine is wanted, it should be designed by a competent builder, and drawings should be given to the maker when it is ordered. As good an engine as I ever saw was built on this system in a second class shop in Pittsburgh; and I am sure that every engineer who has charge of engines and machinery should be a draftsman. But this, probably, would not suit some employers whose only notion of an engine is something with a balanced slide valve, as big as a barn door. Another point in which employers do not recognize the value of a capable engineer is in the economical use of steam.

As ironmasters and workers of iron, many capitalists in this district deserve great credit. Many of them have secured valuable patents for improved processes. But so long as the ability of some engineers is not recognized by them, and the workmen themselves are hardly recognized as mechanics, what use is it for any youth to study for a period of ten or twelve years? The consequence is that the men, who should be readers of scientific books and should have the means to purchase them, are generally wanting in instruction and be come idle, and in some cases, intemperate and immoral.

Gentlemen employers, have you ever once given it a thought that your wealth and property are in the hands of these careless ignorant men? If you paid more attention to these subjects, you would find out what you lose in cost of running and deterioration of machinery; and you would learn to value the services of a competent engineer as you ought. ENGINEER.

Youngstown, Ohio.

To Detect Sulphuric Acid in Vinegar.

To the Editor of the Scientific American:

The method to detect the sulphuric acid cheat in vinegar, given by the *American Journal of Pharmacy* and republished in your paper on page 120, is the most glaring piece of stupidity which I have had the misfortune to encounter for a long time, and the editors of the *American Journal of Pharmacy* should know better than to publish such nonsense. You are perfectly right in wishing that some of your readers might suggest an easier method for this purpose.

The addition of the alcohol is not made in order to take up "the free sulphuric acid to the exclusion of the sulphates," as the druggist's circular states, but to destroy the acetic acid by changing it into acetic ether; the mixture of acetic acid, alcohol, and sulphuric acid, and afterwards evaporating or distilling the same, is exactly the regular method for making the volatile acetic ether, which will be the vapor or the product of the distillation; in this way the acetic acid is disposed of with the alcohol, and the free sulphuric acid and the sulphates are left; pure vinegar must neither contain the one nor the other, and if adulterated with sulphuric acid, it will mostly contain traces of sulphates also. The addition of a solution of chloride of barium will, in any vinegar, without previous unnecessary preparation, at once demonstrate their existence by a white heavy precipitate, which is sulphate of barytes or heavy spar; while pure vinegar will not show this precipitate, simply because acetate of baryta is soluble in water, and not insoluble, as the sulphate. The advice of preparatory treatment, therefore, with alcohol, heating, etc., is absolutely unnecessary, and simply a specimen of as gross an ignorance as is the attempt at explanation.

The sole purpose of my dilating upon this matter is for the amount of chemical instruction it conveys.

Now the simple test of detecting sulphuric acid in vinegar is this: Make a solution of chloride of barium, pour a little in the suspected vinegar; if it remains clear, there is no adulteration with sulphuric acid; if a white cloud shows itself, there is adulteration.

Even the quantity of the adulteration may be determined in this way; when gradually so much chloride of barium has been added to, say, one pint of vinegar till no more precipitate is formed, and this precipitate is then collected by filtration and dried, every three parts of the precipitate will indicate very nearly one part of sulphuric acid adulteration.

P. H. VANDER WEYDE, M.D.

New York city.

Strikes.

To the Editor of the Scientific American:

Perhaps, after the recent disastrous failure, the laboring men will listen to a few words from a brother laborer. I will start with the proposition that all strikes, whatever their termination, are injurious to the working man. Take, for example, the so called success of the shoemakers and coal miners during the late war. The former, according to their letter writers, obtained an average rise of five per cent, and we will concede as much to the latter. The strike lasted some six weeks, more or less, at an average expense of about one hundred dollars per man; how long did it take them to make up this loss? The price of coal nearly doubled in a few months, and foot gear took some very long strides upward; and who reaped the profits? Why, speculators and holders of stocks, of course.

Now, brother workmen, as you do not seem to see it, I will tell you where the laugh comes in. It is when the Crispin pays a double price for his winter's coal, and the miner pays the same increased rate for his boots and shoes; and although the currency had something to do with the rise of the two commodities in question, I venture to say that the strike, so far as it affected the rise, put forty-five cents into the pockets of speculators where it put five into those of miners or shoemakers. J. E. S.

Portland, Me.

The New Type Writer.

To the Editor of the Scientific American:

As the original projector and one of the inventors and patentees of the type writer, which you have so well illustrated on the first page of your issue of August 10th, I must take exception to and protest against any inference, therein conveyed, that Mr. C. L. Sholes, of Milwaukee, Wis., is the sole inventor thereof. CARLOS GLIDDEN.

Milwaukee, Wis.

THE COHOES RAILROAD BRIDGE.—The new railroad bridge spanning the Mohawk river at Cohoes N. Y., is to be 704 feet long and 18 feet wide, and is to consist of four spans of 140 feet each and one of 135 feet. Two spans are already finished, the ordinary combination truss (wood and iron) being employed. The progress of this work has been seriously retarded by the throwing down of one of the piers by the powful current in the river. A force of workmen is now engaged in repairing the damage. The structure is being built under the supervision of the State engineers.

A Shower of Aerolites.

On the 9th of June, 1866, a remarkable fall of aerolites took place in the County Unghvär, in Hungary, which was witnessed by a large number of persons. A violent detonation was first heard, like the discharge of a cannon, making the glass rattle; this was followed by several more feeble sounds, accompanied by a noise like that of a heavy wagon rolling along the pavements. Attention having been attracted by the noise, a small cloud was seen in the distant heavens, which moved rapidly, having about ten times the apparent magnitude of the sun, and which emitted rays of smoke. Persons at a considerable distance off saw a red, incandescent, pear-shaped body, surrounded by a blue light, and which approached the earth at an angle of thirty to thirty-five degrees with great velocity, leaving behind it a train of vapor. One of the observers affirmed that this red body continually emitted incandescent particles, and separated into two parts in its course, and that the two globes of fire fell separately upon the earth. The phenomenon is said to have lasted four or five minutes, while the smoke emitted by the bolide remained visible for ten minutes afterwards. Some persons even professed that they perceived a decided smell of burning sulphur; and one of those who picked up a fragment a little time after its fall said that it was not free from the odor for three days after. The number of stones that fell on this occasion was quite considerable, two of them being much larger than others, one weighing nearly 600 pounds and the other about 80 pounds. At least a thousand fragments were picked up, being scattered over a surface of about 6,600 feet in length by 2,500 feet in width. The largest mass penetrated the earth to a depth of 11 feet, and the smaller to that of about two feet.

Nicholson or Alkali Blue on Wool.

This dye differs from all other aniline colors in the fact that it is not, like magenta, aniline violet, etc., the soluble salt of a base insoluble in water, but a base soluble in water of itself, yet capable of forming, in union with acids, colored and insoluble salts. The base is in itself colorless, or very pale. To obtain a dye, the base already fixed on the fiber must be united with an acid. This is effected by passing the dyed wool through an acid bath. Thus for 10 lbs. of wool, a very dilute solution is prepared by boiling 1 to 1½ ounce of the dye in pure water; a color bath is next prepared at a hand heat, in which 1½ to 2 ounces of borax must be dissolved. An equivalent quantity of the carbonate of potash or soda may be used instead. The borax serves to neutralize any trace of acid existing in the water or the wool to be dyed (possibly also to prevent the working on of certain impurities which may be present in the dye). The solution of Nicholson blue, previously well filtered, is next added. The goods, previously saturated with water, are next entered and kept constantly in motion, while the temperature of the bath is very gradually raised to the boiling point. They are then taken out, worked well in water at a hand heat, and passed into the acid bath, which, for 10 lbs. of wool, should contain 10 ounces of sulphuric acid. Here they are worked till the color is fully developed. The Nicholson, or alkali, blue is the most permanent of all the aniline colors hitherto obtained.

Dispersion of Electricity in Gases.

The gradual loss of electricity by charged conductors, supported by solid insulators and surrounded by air, is due, according to Coulomb, to two causes: first, the imperfect insulating power of the supports, and second, the action of the atmosphere, inasmuch as the small particles that are in contact with the conductor are electrified and driven away, giving place to fresh unelectrified particles, which are influenced in their turn similarly.

Coulomb found that charges which did not exceed a certain limit of electric density were perfectly insulated by the better insulators; this limit varied according to the insulating power of the substance used. For lower densities, the loss of electricity took place only by the atmosphere; and he found that the time in which the charge was reduced to an aliquot part of its amount has a constant value.

The dispersion is found to be nearly the same in dry carbonic acid and atmospheric air; in hydrogen, only about half as great as in these gases.

Moist air does not give a much greater dispersion than dry air.

The dispersion of positive and that of negative electricity take place at the same rate.

PNEUMATIC COAL MINING MACHINERY.—Pneumatic coal mining machines are now employed with much success in several of the British coal mines. The machines are provided with cutting wheels 3 feet 6 inches in diameter, which cut their way into the coal seams with great facility. A face of 120 yards in length has been cut in one night. The cutters are operated by air, which is compressed by means of suitable pumps located upon the surface of the ground, and conducted in iron pipes down the shaft, along the roadway, and by rubber hose pipes into the machines.

BY a recent amendment to the general railway law in Massachusetts, all railways connected with Boston are required to run a six o'clock morning and evening train, and issue tickets therefore at a rate not exceeding three dollars per mile per year, for distances not exceeding fifteen miles. The object of the law is to provide cheap transportation for working people. The rate of fare just established appears to be less than the actual cost. The Legislature ought to have gone a step further and ordered the companies to run a free train. As it is, the amount allowed is hardly worth collecting, so some of the companies think.

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Steam on the Canals.---The Reward of One Hundred Thousand Dollars Offered by the State of New York.---Modification of the Preliminary Tests Required.

At a meeting of the commission appointed by chapter 868 of the laws of 1871, held at the office of the State Engineer and Surveyor, at Albany, N. Y., on the 6th and 7th days of August, 1872, the following members were present: Van R. Richmond, chairman, George Geddes, Erastus S. Prosser, George W. Chapman, John D. Fay, Willis S. Nelson, Wm. W. Wright.

Various persons were heard by the commissioners in regard to the preliminary tests heretofore required, and certain modifications were made, as will appear by the following preamble and resolution, that were passed and ordered to be published:

WHEREAS, It is the opinion of the commission that the intent of the law, in regard to the speed required of competing boats, is that the same shall be determined by the rate of movement through the levels of the canal, not including lockages or the navigation of the Hudson river, and that the objects of the preliminary tests required will be secured by not requiring over 100 tuns of cargo to be carried west; therefore, it is

Resolved, That the first and second resolutions, adopted by this board July 10, 1871, relating to preliminary tests, which were as follows:

Resolved, That for the purpose of carrying out the intent of the law, this commission will require, among the tests to be made, that the several competitors shall make not less than three round trips, from New York to Buffalo or Oswego; each boat to be loaded with not less than 200 tuns of cargo each way; the trips to be commenced as soon as any party is ready, and all completed in the least practicable time. For the purpose of determining the time consumed by each and all the trips, the clearance must show the day of the month and the time of day that the boat passes each collector's office; certified copies thereof to be furnished to the commission. In order to obtain information in regard to the practical working of the several devices in competition, as soon as practicable, the engineer of the commission, Mr. David M. Greene, of Troy, will inspect the same from time to time, as in his judgment may be necessary, and report the facts obtained to this commission.

Resolved, That competitors are hereby notified that for the purpose of carrying out the intent of the law, though it is desirable that the three consecutive round trips from Buffalo or Oswego to New York be made at the earliest time practicable, the whole of the year 1872 will be allowed to such persons as may desire so much time, and the awards will not be made until the close of navigation in that year,"—be and the same are hereby modified by the passage of the following resolution:

Resolved, That boats making the three round trips from Buffalo or Oswego to the Hudson river and return, as heretofore required by this commission for the purpose of determining the rate of speed of said boats, will not be required to continue the trips to New York city, nor to carry more than one hundred tuns of cargo going west, and that deductions from the time consumed in navigating the canals will be made for passing the locks, equal to twenty hours for each round trip from Buffalo, and proportional allowance will be made if the trial is from Oswego. In case of delays growing out of obstructions to navigation, that are caused by breaks in the canals or injuries to the structures or sunken boats, or such as detain boats drawn by horses, the time lost will also be allowed for in computing speed.

The commission adjourned to meet at the office of the canal commissioners, in the city of Syracuse, Tuesday, October 1st, 1872, at 3 o'clock, P. M.

Recent Patent Decisions.

United States Circuit Court—Southern District of Louisiana.

A suit at law upon letters patent for an improvement in metallic ties for cotton bales, granted to Frederic Cook, March 2, 1858. Mary Frances McComb and James Jennings McComb, plaintiffs; and George Brodie, defendant.

THE LAW OF INFRINGEMENT—THE LAW OF DAMAGES.

WOODS, Circuit Judge.

There may be a claim for two inventions in the same patent if they both relate to the same machine or structure; and an action can be sustained for the infringement of either one of these separate inventions when claimed as separate and distinct in their character.

Where plaintiff's patent covered three different features of invention, but suit was brought on one claim only, the jury were instructed to consider the case precisely as if the patent covered that claim alone.

The third claim of Cook's patent of March, 1858, for cotton bale tie, construed to be for the right to use an open slot cut in a buckle, which without the cut would be a closed buckle, so as to allow the end of the tie or hoop to be slipped sidewise underneath the bar through which the slot is cut.

If a party uses the open slot for passing the end of a cotton tie sidewise under the slotted bar, it makes no difference whether such end is in the form of a loop or not, if the result attained is that the end of the tie has been "slipped sidewise through the slot underneath the bar, so as to effect the fastening with greater rapidity than by passing the tie through endwise."

A man cannot have two patents for the same process because for different purposes.

When the means, devices, and organization are patented, the patentee is entitled to the exclusive use of this mechanical organization, device, or means, for all the uses and purposes to which it can be applied, without regard to the purposes to which he supposed, originally, it was most applicable.

To constitute infringement the contrivances must be substantially identical, and that is substantial identity which comprehends the application of the principle of the invention.

If a party adopts a different mode of carrying the same principle into effect, and the principle admits of different forms, there is an identity of principle though not of mode; and it makes no difference what additions to or modifications of a patentee's invention a defendant may have made; if he has taken what belongs to the patentee, he has infringed, although with his improvement the original machine or device may be much more useful.

All methods, however changed in form, but which act on the same principle and effect the same end, are within the patent; otherwise a patent might be avoided by any one who possessed of ordinary mechanical skill.

The rule of damages at law is not what the defendant has made, or what he might have made, but it is the loss sustained by the plaintiff by reason of the infringement.

If plaintiff was ready to supply the market with his patented goods, and his business was hindered or interfered with by the competition of defendant, plaintiff's damage will be the amount of profit which he has lost by reason of such interference.

If a plaintiff neglects to prove that his patented article was stamped, or that he gave to the infringer the notice required by section 38 of the patent act of 1870, a jury cannot award him more than nominal damages.

W. M. Randolph, C. Roselius, J. A. Campbell, and S. S Fisher, for plaintiffs; Semmes and Mott, for defendant.

United States Circuit Court, District of Massachusetts.

WOODWARD *vs.* MORRISON *et al.*

This was a suit in equity, brought against Louis P. Morrison and George G. Noah by Joseph Woodward, for an alleged infringement of letters patent granted the complainant, February 20, 1866, for an improved prepared paste for book binders.

INFRINGEMENT UPON ARTICLES OF MANUFACTURE—INFRINGEMENT OF CHEMICAL PROCESSES—CHEMICAL EQUIVALENTS—CONSTRUCTION OF PATENTS.

SHEPLEY, Circuit Judge.

The invention patented to Joseph Woodward, February 20, 1866, for an improved paste, consisted in the discovery that the use of a very minute quantity of corrosive sublimate would arrest the tendency to fermentation in the paste, without imparting to it any poisonous properties; also, that an improved result was effected by the addition of chloride of sodium, or an equivalent salt, soluble in the aqueous solution of corrosive sublimate.

A paste in which corrosive sublimate is used in proper quantity to prevent decomposition without making the compound poisonous and unsafe to handle, held not to be anticipated by a paste in which the same ingredient is purposely used in such quantity as to make the compound poisonous and destructive of animal life.

Semble, that where the patented invention is an entirely new article of manufacture it might be sufficient to find that the defendant makes substantially the same thing, whether by the same or a different process.

Patents are infringed by the substitution of chemical equivalents as well as of mechanical equivalents.

The use of chemical equivalents may infringe a patent even if in some respects they are improvements on the original process patented.

To constitute an infringement of a chemical process, it is not necessary that the substituted ingredient be the equivalent in every respect and for every purpose of that in place of which it is used; it must only be an equivalent in the particular process, contributing to produce the same composition of matter by substantially the same chemical action.

Where the patentee of an improved paste used the chloride of sodium mainly for increasing the solubility of the antiseptic agent employed and assisting in its diffusion through the mass of the paste: *Held*, that the use of the chloride of zinc, which in the particular process produced practically the same result, was an infringement.

Every specification is to be read as if by persons acquainted with the general facts of the mechanical or chemical science involved in the invention; and the specification of the parts is a specification to ordinary skillful mechanics or chemists of the well known mechanical or chemical equivalents.

If there are equivalents, mechanical or chemical, existing, but previously unknown to ordinarily skillful mechanics or chemists, these are not included in the specification of a patent unless specially stated therein. They are new discoveries in themselves, and may be used by all without infringing the patent.

The ingredients and the proportions thereof in their respective formulas of manufacture, as stated in the respective patents, are as follows:

Complainants.	*Defendants.*
Flour, 2 pounds.	Flour, 100 pounds.
Common salt, (chloride of sodium, Na. Cl.,) 1 ounce.	Chloride of zinc, 5 pounds.
Alum, ¼ ounce.	Alum, 5 pounds.
Corrosive sublimate, (bichloride of mercury, Hg. Cl.,) 6 grains.	Bichloride of mercury, 1 ounce.
	Oil of cloves, ½ ounce.

JAMES B. ROBB, for complainant.

H. G. PARKER and B. C. MOULTON, for defendants.

ELECTRIC ILLUMINATION OF LIGHTHOUSES.—The following is a list of the electric lights in England and France with the dates at which they were erected: Dungeness, January, 1862; Cape La Heve, France, South Light, December, 1863, North Light, November, 1866; Cape Grisnez, France February, 1869; Souter Point, England, January, 1871; South Foreland, England two lights, January, 1872. It is interesting to see, says *Nature*, that England took the lead in this matter of the adaptation of electric illumination to lighthouse purposes, and it must also be remembered that although the first electric light was only erected in 1862, yet in 1859 experiments were made, under the supervision of the late Professor Faraday, which were very successful.

[We believe that in the United States there is no lighthouse in which the electric light is employed.—EDS.]

A SPROUTING SNAKE.—Professor Cope states that he had for sometime a specimen of *Cyclophis æstivus*, received from Fort Macon, N. C. The slender form of this snake and its beautiful green and yellow colors, show that it is of arboreal or bush-loving habits. It never exhibited such in confinement, however; and instead of climbing over the caladia, ferns, etc., it lived mostly under ground. It had a curious habit of projecting its head and two or three inches of its body above the ground, and holding them for hours rigidly in a fixed attitude. In this position it resembled very closely a sprout or shoot of some green succulent plant, and might readily be mistaken for such by small animals.

AN acorn suspended by a piece of thread within half an inch of the surface of water in a hyacinth glass, will, in a few months, burst and throw a root down into the water, and shoot upwards its straight and tapering stem, with beautiful little green leaves. A young oak tree, growing in this way on the mantelshelf of a room, is a very elegant and interesting object.

MANUFACTURE OF PINS.

A recent visit to the works of the Empire Pin Company, situated in Cohoes, N Y., afforded us an opportunity to witness the entire process of pin making. The wire for this purpose is received in large coils, and the first proceeding is to render it straight and free from kinks and turns. Entering a long room filled with numberless little machines, which united to make an almost deafening clatter, our attention was directed to a coil of wire which had just been placed on a revolving spindle. The end was passed through an apparatus containing several small rollers, and then allowed to wind around a large wheel some two feet in diameter. From this wheel the coil is cut off in sufficient lengths. We now pass to the pin making apparatus proper, that is, the numerous small machines which spitefully seize the wire, drag it along under cutters, bite off small pieces, then supply each of the several bits with a head and sharp point, and finally throw them into a receptacle as nearly finished pins at the rate of hundreds per minute. We say "nearly finished," because, to all appearances, a handful of pins in their present condition appear to be all ready for use. But they are rough, they are still of yellow brass, and their points are far from smooth. We are now shown two revolving barrels into which, with a quantity of sawdust, the pins are thrown. Here they are rolled until perfectly smooth, when they are removed and treated to a boiling for four hours in a solution of cream of tartar and water, from which bath they emerge literally as "clean as a new pin," and, besides, thoroughly whitened.

Next they must be sorted. Pins of every size, some short, others long, must be separated, and each length placed in distinct boxes. To effect this, they are thrown on an inclined tray; down they slide, ranging themselves side by side. Now they pass over a piece of steel, in the edges of which indentations are cut of varying depths. Each pin keeps on its journey until it reaches a point at which one of the indentations makes a passage sufficiently wide for it to pass through lengthwise when it falls into its proper box.

The pins being now sorted, the next process is to place them in their papers. Being heaped upon a horizontal tray, they are sent, by a sweep of the attendant's hand, traveling down an inclined plane of steel, in which slots have been cut. Each slot is made of such a width as to allow the body of the pin to pass through but not the head. There are as many of these slots as there are to be pins in a row. The pins sliding down range themselves in an even line at the foot of the plane. Meanwhile a continuous roll of paper has been attached to the machine from underneath. This, as each row of pins is ready for insertion, is pressed and held into a die, which forms crosswise creases in it. The pins are then forced down through these creases, the paper leaves the die, and is rolled along; another row of pins falls into place, and the operation is repeated. The paper, when filled, is cut off into proper lengths, and sent to girls to supply missing pins. As each paper is completed, it is folded and then packed in bundles of a dozen each, marked, labeled, and sent to the market.

There is another auxiliary machine connected with this manufacture by which the pins which are crooked and which fall through the last described apparatus are separated from the straight pins which become mixed with them. This is done by causing the pins to fall upon a number of endless leather belts. The crooked ones remain steady, and are carried along the belts and dropped into a receptacle at the end of the machine. The straight pins, however, in falling upon the belts do not rest upon them, but, receiving by this means a vibratory motion, roll off between the belts and are caught in a box underneath. The great rapidity of this work can be judged from the fact that some 650 packages of pins, each package containing a dozen papers, are daily turned out at the works of the Empire Company.

CARBONIC ACID FROM THE LUNGS.—It is customary to show the presence of carbonic acid from the lungs by breathing into lime water, and as the experiment is usually performed, it is necessary to blow through the water for a considerable time. Dr. Krebs recommends the simple device of holding the nostrils when making the expiration; it is then possible, by drawing a long breath, to obtain a considerable precipitate in lime water in one expiration. The difficulty has been that nearly all of the carbonic acid escaped through the nostrils, and hence the erroneous impression that only a small quantity was given off from the lungs.

VALUE OF POULTRY MANURE.—From actual experiment it has been found that the droppings from four Brahmas for one night weighed in one case exactly 1 lb., and in another more than ¾ lb., an average of nearly 4 ounces each bird. By drying, this was reduced to not quite 1½ ounce. Other breeds make less; but, allowing only 1 ounce per bird daily of dry dung, fifty fowls will make, in their roosting house alone, 10 cwt. per annum of the best manure in the world. Hence ½ an acre of poultry will make more than enough manure for 1 acre of land, 7 cwt. of guano being the usual quantity applied per acre, and poultry manure being even richer than guano in ammonia and fertilizing salts. No other stock will give an equal return in this way; and these figures demand careful attention from the large farmer. The manure, before using, should be mixed with twice its bulk of earth, and then allowed to stand in a heap, covered with a few inches of earth till decomposed throughout, when it makes the very best manure which can be had.

The Union Mill Company, of Fall River, Mass., make print cloth, and they pay dividends of 140 per cent annually on the stock of the corporation.

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SPRING POWER FOR SEWING MACHINES.

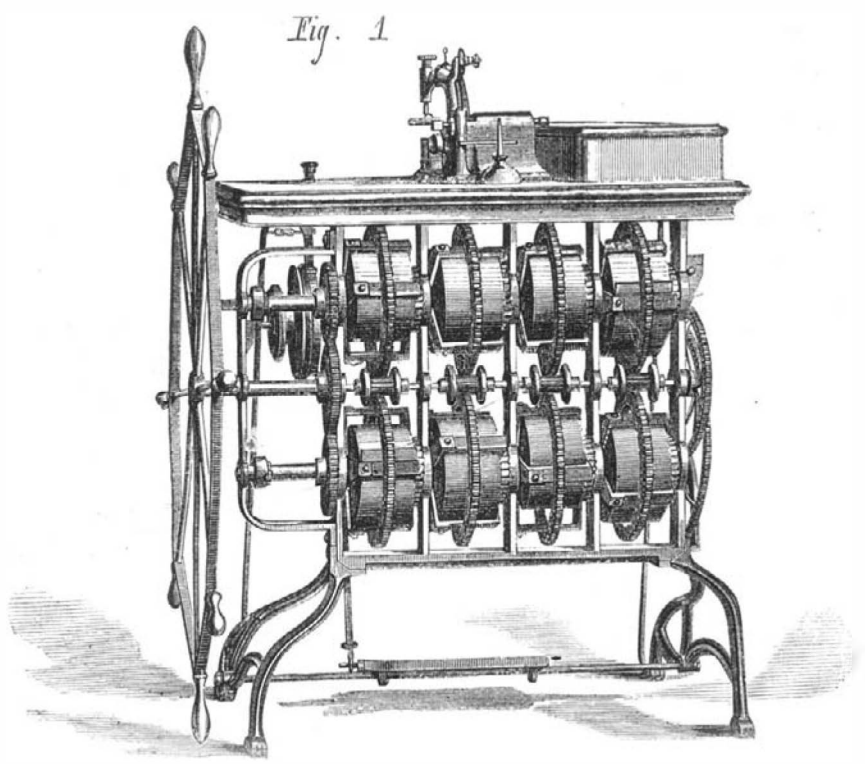
On page 247 of the previous volume, we laid before our readers the results of the investigations made by the Massachusetts State Board of Health into the injurious effects upon the health of women employed in running sewing machines by foot power. The facts were established that among such operatives certain diseases exist in a greater proportion than with other females, and that they result from excessive work in propelling the machine by the feet. It was shown, further, that what proved excessive labor in one form might be far from excessive in another, and that the number of hours these operatives work daily would not injure them if the machines were run by steam or other power.

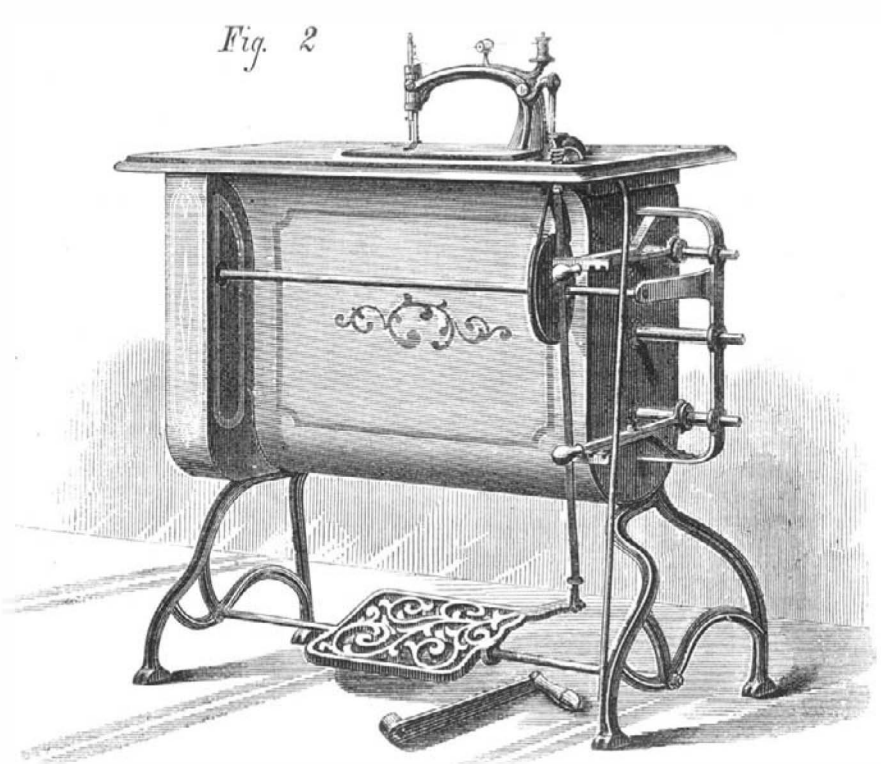
The invention we now illustrate appears to meet the requirements of the case by furnishing a simple and economic motor which can conveniently be applied to any form of the sewing machine. It consists of a spring power, mounted in a neat frame, to the top of which the table of the machine is attached.

Fig. 1 shows the apparatus, uncovered so that the driving mechanism may be seen; and Fig. 2 shows the same applied to a machine of a different manufacture, and cased. The motive power consists of eight coiled springs which are mounted on sleeves on parallel shafts, four on each shaft, as shown in Fig. 1. Each of these shafts is grooved longitudinally so as to carry a sliding key which is worked by a sliding collar on the outer end of the shaft. By means of this key, the sleeve of either of the springs can be locked with its shaft so as to allow of its being wound up by the rotation of the same. Both shafts are connected by gearing with a central one, and the winding up is done by means of a detachable hand wheel or windlass placed on the latter, as in Fig. 1, or by means of a crank handle such as is seen at foot of Fig. 2. In winding up, one spring on each shaft, upper and lower, may be locked and wound simultaneously. The power developed by the recoil of the springs is communicated through gears to a central shaft, as in Fig. 1, from which it is transmitted by appropriate gearing and a pulley and belt to the driving shaft of the sewing machine. A brake, represented in both figures, is attached to the apparatus, and by its means the machine is started or stopped, and its speed regulated. The treadle shown in the engravings is employed solely to operate this brake while at work; and by its use the speed may be slackened or allowed to start up again, etc., with great nicety and ease. The brake is also further adjustable by means of a spring lever and thumb screw, which are connected therewith and are placed for operation on the top of the machine table, as represented. A still further adjustment of the apparatus is provided for in the shape of an attachment by means of which two or four of the springs, as desired, may be locked off and prevented operating on the central shaft. We may remark, also, that the winding up can, by the construction, be done while the machine is running, if required.

Two sizes of the spring power are at present manufactured, the larger of which is calculated to run for one hour and the smaller for half an hour, the speed in each case being one third faster than that obtained in working a sewing machine by foot power. We are informed that a man can wind up the whole eight springs of the larger size in one minute, using the crank handle; and that a lady, using the hand wheel of large diameter, would accomplish the same in less than five minutes. Thus, in a day of ten hours, less than an hour would be occupied in winding up springs, and over nine hours would remain for mere sewing, unaccompanied by hurtful exertion; while the work accomplished would be more than could be done in the ordinary manner on account of the extra speed. It is stated that a boy of fourteen can do all the winding up necessary to keep twenty machines going.

Mr. John M. Cayce, of Franklin, Tenn., is the inventor of this power, which is patented in this country and in Europe through the Scientific American Patent Agency. Further information may be obtained of the United States Combination Spring Power Company, 97 Spring street, New York.





CAYCE'S SPRING POWER FOR SEWING MACHINES.

Chinese Wheelbarrows.

Crossing some uncultivated chalky downs in the province of Honan, where the roads were good, Mr. Oxenham came upon large numbers of wheelbarrows; and in one place where the country was unusually high and open, and where a strong wind was blowing in their favor, all of them set up a sail to assist them in their journey. The men who use these cumbrous and loud shrieking vehicles contrive to make about 20 miles a day, and in the event of a favorable wind, often 30. One man generally manages the wheelbarrow, though he sometimes avails himself of the services of his son, his wife, or his donkey. No laborer in the United States or Europe probably undergoes an equal physical strain to the Chinese barrowman, who seldom reaches the age of 40 years.

GOODRIDGE'S AUTOMATIC LAMP EXTINGUISHER.

The accompanying engraving represents a neat and ingenious device for attachment to kerosene lamp burners, by the automatic operation of which the extinguishment of the light is immediately effected in the event of the accidental falling or tilting of the lamp.

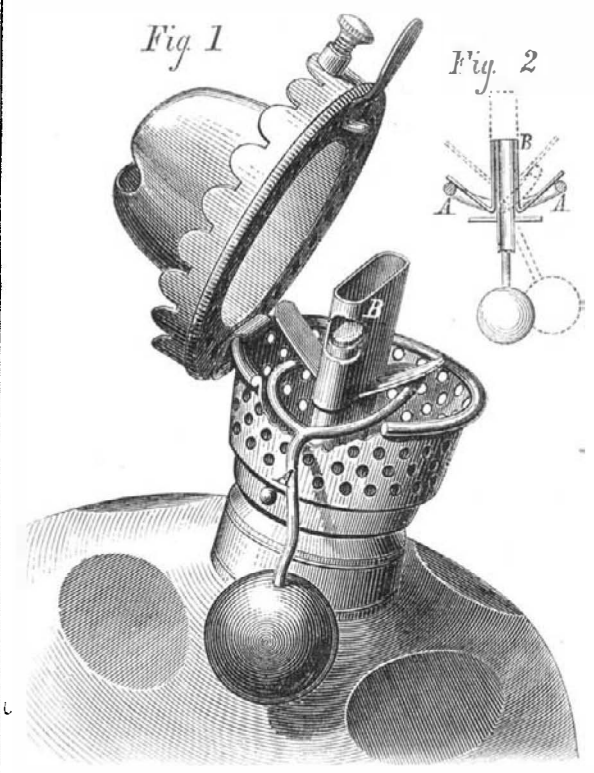


Fig. 1 gives a perspective view of a burner with the extinguisher attached. Part of the outward shell of the burner is broken out to show the ring and bent wire, A. The ring which, it will be observed, entirely surrounds the wick tube is pivoted to the shell, on the further side, by a pin which enters one of its perforations; on the nearer side, the bent wire, which passes through another perforation, also acts on a pivot. On the lower end of the wire hangs a leaden weight, the tendency of which is always to keep the wire in a vertical, and the ring, consequently, in a horizontal, position. At B is shown the extinguisher proper, which consists of a short piece of tube which is placed on the end of the wick tube and slides easily thereon. It is provided with the two projecting arms seen in the engraving, where it is represented with a hole in one side to show the tube and wick within. When the lamp is in an upright position, the extinguisher is supported by the ring, on which its arms rest, and is placed sufficiently far down on the wick tube for the latter to be on a level with or project slightly above it. Under these conditions, which are represented in the sectional view, Fig. 2, the light is free to burn, but upon the weight being swung, or the lamp being caused to deviate from its vertical position, one or other of the sides of the ring is thrown upward and carries with it one of the arms of the extinguisher; by which means the latter is thrust beyond the wick tube and over the wick, and the light is extinguished. The latter conditions are shown in Fig 1, and indicated by the dotted lines in Fig. 2. By bending upward the sides of the ring, the parts may be adjusted so that a very slight tilting of the lamp suffices to put the light out.

In the provision thus made for extinguishing the lights before the oil in the lamp has time to escape and become ignited, appears to lie a safeguard against many of the disastrous results hitherto attending lamp accidents.

Patented March 12, 1872, by John M. Goodridge, of Norfolk, Va., of whom further information can be obtained.

Instrument for Measuring the Transparency of the Sea.

A correspondent of the New York *Herald*, accompanying Professor Agassiz' expedition on the coast survey steamer *Hassler*, gives a brief but interesting account of an apparatus for determining the relative transparency of the sea at different places, which has already been employed by the expedition at Barbadoes and about the Galapagos Islands. A strip of board, about four inches wide and four feet long, divided into a scale of ten equal intervals, is painted a dark lead color at one end, fading into white at the other. A large white board having been fastened parallel to it, and at a measured distance below it, the whole arrangement is lowered horizontally into the sea. At the dark end, the upper board appears the darker, but at the white end, the lower board, being seen through a greater depth of water, gives the darker appearance, and, of course, at some intermediate division, the two boards appear to be of the same shade. At that division the relative whiteness of the boards is evidently a measure of the percentage of light absorbed while going down and up again through the distance by which the boards are separated. This relative whiteness is readily estimated at night in the cabin by placing the boards at unequal distances from a candle so as to make them of the same apparent shade at the given division of the scale.

The illuminating powers are to each other as the squares of the distances of the boards from the light. Having once ascertained what percentage of light goes through a fathom, the proportion of daylight which reaches any given depth in the sea can be readily calculated. Suppose, for example, that one half the light penetrates one fathom; then one quarter goes down two fathoms, one eighth, three fathoms, and so on indefinitely.

This apparatus is the invention of Dr. Hill, who regards it as still in a crude form, and capable of much improvement

PROFESSOR PALMIERI records a singular observation on the recent remarkable eruption of Mount Vesuvius. The vaporous emanations alone were observed to be charged with positive electricity, while the ashes alone were charged with negative electricity. Hence electric effects resulted from the collision of the clouds of ashes with those of vapor, thunder and lightning being produced as in an ordinary storm.

THE brewers in this country are considerably exercised by an attempt, on the part of the holders of William Marr's patent of 1867, to collect damages for the use of bisulphite of lime, which is employed to arrest the fermentation during the brewing operation. The grant of this patent appears to have been a blunder on the part of the Patent Office, as bisulphite of lime has been so employed for many years.

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TERRESTRIAL MAGNETISM.

The old notion that the earth possessed, near its north pole or in its interior, strong magnets which attracted the poles of the compass needle has long ago given place to the theory that our whole planet must be considered as a large magnet, and to the later hypothesis that this magnetism is caused by electric currents running east and west through its crust, and in regard to which the compass needle behaves as it does to all electric currents, namely: it places itself at right angles to the same, according to the law discovered by Oersted in 1829. By this theory the declination of the compass needle from the geographical north is simply explained by the fact that there is no cause which should compel these currents to run exactly east and west; on the contrary, by the irregular formation of the earth's crust, it cannot be expected otherwise than that these currents, which always follow the path of least resistance, should not coincide with the geographic parallels, and that consequently the direction of the compass needle, which must be at right angles to these currents, cannot coincide with the geographic meridians. This being the case, it is evident that the magnetic pole cannot coincide with the geographic pole, and in fact observations in high northern latitudes on this hemisphere have decided that, at present, the magnetic north pole, that is the point towards which the compass needle points, is situated in the arctic archipelago north of the American continent, in longitude of very near 100° west of Greenwich, and a latitude of 73° N. The magnetic south pole, in regard to latitude, is very near to the antipodes of this point, being in 74° S., but in regard to longitude, this is not the case; the antipodal point of 100° W. longitude lays in the meridian of 80° east of Greenwich; but the fact is that the magnetic south pole is at present at 140° east of Greenwich.

We can, of course, draw lines on the globe through those places where the compass needle points to the magnetic pole; in other words, when we travel from any place on earth and follow the direction of the compass needle till we reach the magnetic pole, and draw the line traveled over on the globe, we shall have a magnetic meridian. Those magnetic meridians can, of course, nowhere coincide with the geographical meridians, but must intersect them continuelly. Other systems of magnetic curves have been drawn; for instance, those of equal declination, that is, such curves as unite points where the declination of the compass needle from the geographic pole is the same. Those lines are quite irregular, much more so than the magnetic meridians, and even exhibit a great complexity. The line without declination runs from the magnetic north pole, south through Hudson's Bay and Lake Erie to Virginia, and enters the ocean in North Carolina; it skirts the Antilles and crosses the eastern point of South America. East of this line, the compass needle points north towards the west, and west of this line, it points north towards the east; and it generally deviates more in proportion as we go to greater distances from this line without declination; so while at present in Maine the declination is some 20° west, and in California, 20° east, it is in Newfoundland 40° west, and in northern Alaska, 40° east.

The reader will have noticed that we have used several times the expression "at present." This was by reason of the singular fact that all these data are continually changing. Observations made since the last three centuries and recorded on maps, for the years 1600, 1700, 1800, and 1870 prove that the magnetic poles are continually shifting their position; and this shifting is taking place regularly from east to west. Thus, in 1600, the magnetic north pole was somewhere north of Europe, and the line without declination ran through the heart of that continent, so that in the western European countries the declination was from 5° to 10° east; then it proved to be moving westward, so that the line of no declination passed over England some 100 years later, when the declination for the whole of Europe became west and was increasingly so till about 1820, when it had reached about 24°. Since this time, it is diminishing again in degree, while in the Eastern States of America it is increasing, so that in New York city, where a few years ago it was 6°, it is now more than 7° W. This points to a regular travel of the magnetic pole around the geographic pole, and, as far as we may conclude from a rather premature estimate, it will take a little over 600 years for a complete revolution, so that in the year 2200 it will again have arrived in the north of Europe.

There are two theories in explanation of this surprising phenomenon; one is that a great portion of the earth's magnetism is due to induction from celestial bodies and therefore under their influence, so that the relative position of the planets may affect the earth's polarity. The other theory, quite recently brought forward, is that the upheaval of continents and islands and in general all changes in the earth's crust, which are especially very active near the poles, modify either the magnetism or the direction of the electric currents which are the causes of the same.

In closing, we cannot forego drawing attention to two significant facts. One is that the aurora borealis appears to proceed always from the magnetic and not from the geographic pole as a center; the other is that the magnetic pole appears to coincide with the point of greatest cold, and even that the lines of equal mean temperature, or the so-called isothermal lines, when drawn on the globe, show such a close relation to the magnetic pole as to give evidence that they are to a great extent governed by the same fundamental law.

THE INTERNATIONAL EXPOSITION AT VIENNA, 1873.

In reply to inquiries for the name of the United States Commissioner for the above exhibition, we would state that Thomas B. Van Beuren, Esq., 51 Chambers street, New York, is the proper address. All persons who are desirous of going to the trouble and expense, of shipping their goods to Austria for this show, should communicate with the Commissioner as above. It is stated that there will be but few American exhibitors. This is not to be wondered at when we consider that under our present financial conditions—due, as the free traders allege, to our taxes and high tariff—it is not possible for Americans to compete with Europeans in filling orders for manufactured goods. It is, therefore, useless for our people to go over to Austria to exhibit the products of their skill and ingenuity. The only practical result would be that our best patterns would be copied without benefit or reward to the American maker. He could fill no orders, export no goods, simply because the continental manufacturers can do the work much cheaper and underbid his best proposals. When prices advance on the other side of the Atlantic, or become reduced here, then will be the time to talk to our people about going abroad to show their goods.

As for the exhibition of new inventions at Vienna, the Austrian patent laws offer but precious little encouragement and protection for American inventors, as we have heretofore had occasion to explain.

TUNNEL UNDER THE HARLEM RIVER, NEW YORK

The Park Commissioners of New York city contemplate the construction of a large tunnel at the upper end of the island, for the purpose of providing a carriage way under the Harlem river, from the end of the Seventh avenue drive. This is an excellent improvement and we trust will be speedily carried out. It will furnish a much needed communication between New York city and Westchester county. At the present time, the only avenues of access are the draw bridges, which occasion frequent delays, not only to the general traffic but to the railway trains.

The tunnel will be built of solid masonry, and extend 1,663 feet on the New York side, and 1,078 feet on the Westchester side of the river. It is contemplated to have the top of the arch 18 feet below high water mark, so that vessels drawing 17 feet can pass over safely. The tide falls about five feet at that point; and at low tide, vessels drawing less than 13 feet will be able to pass over in safety. It is proposed to have the tunnel about 2,759 feet long, and 16 feet in hight, to permit persons to stand on top of the highest omnibus, and 34 feet in width; this affords 20 feet of wheeling space and seven feet on each side for foot passengers. The descent will begin at 150th street, and the top of the tunnel will strike the water bed at 155th street, at a point about 200 feet south of the present Macomb's Dam bridge. The descent will not be steeper than many of the roads in the Central Park, and will not inconvenience horses drawing heavy loads. The expense is estimated to be about $1,500,000. A. W. Grant, C. E. is the engineer of this important work.

WILLIAM BRIDGES ADAMS.

We regret to have to record the decease of this distinguished civil engineer, inventor and scientific writer, whose name and works are doubtless familiar to our readers. He died recently, in England, the land of his birth, at the age of 75 years. Many of his suggestions in respect to railway improvements have been brought into common use, and among them is the so called fish joint, for uniting the ends of rails.

The employment of light steam cars and carriages is becoming every day more common. Their practicability was perhaps as completely demonstrated by the late Mr. Adams as by any other one person. We find in *Engineering* the following particulars concerning the performances of one of the early vehicles of this kind, made by Mr. Adams:

The total length of the carriage was 12 ft. 6 inches, including machinery, water tank, and seats for seven passengers, all being placed on one frame, which was hung below the axles, and carried on four wheels, 3 ft. 4 inches in diameter. The floor was within 9 inches of the level of the rails. The engine had two steam cylinders, 3½ inches in diameter, and 6 inch stroke, acting on a cranked axle. The boiler was cylindrical, placed vertically, and was 1 ft. 7 inches in diameter by 4 ft. 3 inches high. It contained a firebox, 16 inches in diameter by 14 inches high, with 38 tubes, 3 ft. 3 inches long by 1½ inches in diameter, giving 5½ ft. of heating surface in the firebox and 38 ft. in the tubes. The water tank was placed under the seat, and had a capacity of 40 gallons.

The number of miles run during the half year, ending July 4th, 1848, was 5,526, the quantity of coke consumed being 7 tuns 9 cwt., or at the rate of 3 lb. per mile. At the date of this extract, the engine had run altogether about 15,000 miles; the greatest speed attained on the level was 41 miles an hour, the ordinary speed that might be safely calculated on for a long journey being 25 miles an hour. She had performed the journey from London to Cambridge, a distance of 57½ miles in 1¾ hours, being at a rate of nearly 33 miles an hour, with a consumption of coke of 2¾ lb. per mile. This carriage was subsequently named the *Express*, and was sent down to Birmingham to be experimented with, where, to the astonishment of some of Mr. Samuel's friends—who had planned the matter—she ascended the Lickey incline of 1 in 37

SECURITY AGAINST THIEVES.

A bold bank robbery was committed not long ago at Uxbridge, Mass. The thieves surrounded the cashier's house in the dead of the night, and by means of ladders entered the open windows of the second story. They then gagged all the inmates, compelled the teller, on pain of death, to go with them to the bank and open the safe, which they immediately plundered. Loss, thirteen thousand dollars.

"The moral of the affair is," says *Appleton's Journal*, "that cashiers and tellers of banks must cease to go to bed with their chamber windows open, and that banks in the country must resort to some means of defense and protection more efficacious than the locks of a patent safe. An armed man and a stout dog in the Uxbridge bank would have prevented this robbery, and in the long run, it would be cheaper for a country bank to pay for a permanent night watchman than to be robbed, even if only once in a generation. The Uxbridge robbery is one of a series of similar outrages which have been perpetrated on the banks of New England during the last five years, and their frequency shows clearly that banks in the country cannot exist much longer in the old primitive fashion, but must fortify and arm themselves if they would keep their treasures safely."

We do not quite agree with the *Journal*. Instead of the dog and watchman, our advice to the banks is to make use of the better and surer means of protection which our ingenious inventors have provided in the shape of electrical alarms and detectors. For a tithe of the cost of maintaining a sleepy watchman, the Uxbridge bank might have had electric wires, attached to its doors and safes and also to the doors and windows of its cashier's dwelling, so arranged that any attempt of a burglar to enter would have rung an alarm bell and aroused the whole town. Entrance through open windows may be guarded by the use of a fly net to be connected with the wires. Any attempt to pass the net sounds the alarm. With the other forms of window, door, and safe alarms, our readers are familiar. We are never very sorry to hear of a bank robbery where the owners and officers have been so parsimonious as to refuse to employ the best electrical burglar alarms. Many of them turn up their ignorant noses at the idea of using such "patent gimcracks," as they call them, about their premises. But they must either use them or submit to robbery. Some of the heaviest and most astounding bank robberies have been committed upon banks that employed special watchmen at great expense, who were overpowered by the thieves, or were absent from their posts at the critical moment. But we have yet to hear of a single example of bank robbery where the electric alarm was properly applied.

THE INTERNATIONAL STATISTICAL CONGRESS.

The International Statistical Congress has opened its eighth session in St. Petersburgh, Russia. The delegates are divided into four sections, to each one of which the following subjects are assigned for consideration and report: To the first section, statistics of population, with methods of obtaining the same. Under this head, the number, sex, trades, and ages of the population of various countries will be discussed, together with the moral, intellectual, and physical condition of the people. Comparisons will also be made with reference to determining whether retrogression or progression has been made from a former state. To the physical development of man will be given considerable prominence. Investigations on this subject will include the hight, weight, volume, and development of different parts of the body, the strength, rate of walking, respiration, pulse, beating of the heart, and comparative acuteness of the senses.

To the second section, the most important part of the labor of the Congress is assigned. This is the discussion of industrial statistics. The subject is divided into five classes: Agriculture, mines and quarries, commerce and fisheries, and

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manufactures. These are subdivided so that no detail, however small, will be omitted.

The third section will discuss the statistics of commerce and postal relations. Many difficulties to the accomplishment of this work are anticipated. The principal is that of fixing a uniform nomenclature for the leading articles of commerce, without which it is almost impossible to arrive at satisfactory results, and also that of obtaining the true values of merchandise for use as a basis of comparison between aggregates. The fourth section will devote itself to discussions similar to those of the Prison Congress lately held in England—the statistics of criminal justice.

The more than ordinary importance of this Congress will render its proceedings of great interest, and we look for much valuable information from the results of its deliberations.

A NEW CANAL STEAMER.

We published not long ago illustrations of Captain Goodwin's improvement in canal propulsion, and spoke of it as one of the plans most likely to prove practical and successful. We are gratified to be able to state that a pair of these canal boats have lately been constructed by the inventor, at Buffalo, and in the course of two or three weeks they are to be put on trial on the Erie canal.

The peculiar features of the plan are, first, a floating propelling wheel, extending entirely across the bow of the boat, somewhat like those employed at the sterns of the Western boats. Second, cheek pieces extending alongside of the bow wheel, so as to enclose the water in front and cause it to be driven under the bottom of the boat as the latter advances. Third, a peculiar formation of the stern of the vessel, so as to admit of the connection therewith of a train of barge boats, which when united shall form a unity, so far as propulsion is concerned.

The two boats just built are each 96 feet long by 17 feet wide, and will have a carrying capacity each of 240 tuns The engine is of 40 horse power, capable of working up to double that power if required. It is expected that the two boats when connected will be propelled with a speed of from four to six miles per hour. Of the actual performances of the vessels, we shall give a report in due time.

THE NEW RAILWAYS ACROSS THE CONTINENT.

Colonel Thomas A. Scott, the celebrated railway projector and manager, recently made a speech before the wealthy men of New Orleans, inviting them to join in the construction of a railway from New Orleans to Shreveport, for the purpose of connecting New Orleans with the Texas & Pacific Railroad, of which Colonel Scott is president. In the course of his remarks, Colonel Scott stated that the Texas and Pacific Railroad, the construction of which is now rapidly progressing, will extend from Shreveport, La., to San Diego, Cal. There will also be a parallel connecting line, beginning at Texaskana, and running westerly to Fort Worth, in Tarrant county, Texas, where it joins the trunk line. Colonel Scott stated that the entire line from Shreveport to San Diego will be finished within six years, and if the citizens of New Orleans now join in the construction of the proposed road from New Orleans to Shreveport, they will be enabled by or before the year 1878 to take the cars in their own city and ride direct to the Pacific ocean. The Texas and Pacific Company expect to have five hundred miles of their road completed within the next two years. The portion of Texas through which it passes is very rich in agricultural and other productions.

Still another new transcontinental railway enterprise is in progress, that of the Atlantic and Pacific Railroad Company, lately incorporated under the authority of the Legislature of California. The line is to be located south of the snow line, so as to avoid the detentions which so seriously interrupt the Union Pacific in the winter time. This road is intended to connect with the Atlantic and Pacific Railway of Missouri, a portion of which, over three hundred and fifty miles in length, is already in operation west of St. Louis. It is asserted that the city of San Francisco will subscribe heavily towards this new road, as the citizens have become alarmed by the efforts of the Central Pacific Company to concentrate the entire railroad system of the State in their own hands, with the terminus at Goat Island—a project which, besides establishing an immense moncpoly, is claimed to threaten the destruction of the present harbor of San Francisco, and the building of a rival city on the opposite side of the bay.

When these new highways are completed, we shall have four great railway avenues in operation across the continent, to wit, the Union Pacific, the Northern Pacific, the Texas and Pacific, and the Atlantic and Pacific.

IMPROVEMENTS THAT ARE MUCH NEEDED.

The steamboat Bristol, one of the large and magnificent vessels that navigate Long Island Sound, plying on the Boston route between New York and Fall River, lately collided at Newport, during a fog, with a ship lying at anchor. The sailing vessel, which was loaded with railroad iron, was cut down and sank, while the steamer was damaged in the bow and was run ashore to prevent sinking. As it was, her hull filled. Steam pumps were sent for, which, in a few hours, set the Bristol again afloat and she was soon repaired.

The Bristol is a noble vessel. She was built at an expense of one million of dollars, with first class boilers, engine, blowers, indicators, hose pipes, etc. Her cabins are elegantly upholstered, adorned with gilt, lighted with gas; her twelve hundred passengers are entertained, during every trip, by regularly employed bands of music, are supplied with good things from a generous larder, and served by an effective corps of the politest negro waiters. In short, the vessel is a floating palace, sailing with almost every appointment and luxury that money can supply. But in one most important requisite, namely, the means of flotation, the Bristol is sadly deficient.

The ordinary mechanic, not experienced in navigation, if asked to give his ideas as to the prime requisites for a passenger steamboat, would naturally say that the first thing to do was to provide the most ample means possible for keeping the ship afloat. But it is just here that owners disagree with him, and the Bristol is a case in point. With an operating steam force on board of nearly three thousand horse power, she was unprovided with the means of rendering her power available for pumping, and sank ignominiously into the mud.

A decent regard for the lives of passengers, to say nothing of their own property, would seem to make it the obvious duty of the owners of the Bristol to provide her with pumps, equal, at least, to an emergency like that lately encountered. Had the accident occurred on the open Sound, instead of near the bank of a river, the vessel would doubtless have gone to the bottom, with loss of many lives.

We are aware that owners are desirous of avoiding the transport of dead weight, and hence they economize in pumps and other safety apparatus. But we believe it to be poor economy. They should place on board the most effective means for safety that can be procured, calling upon ingenious people to remedy any defects that experience suggests. The invention of improved means for the flotation of vessels in case of disaster is still urgently demanded.

We trust that some of our readers will investigate this subject specially, and study out some new and effective method of rendering available for safety, in the hour of need, the immense steam force of such vessels as the Bristol. The dimensions of this boat are as follows: Length 373 feet, beam 83 feet, depth 16 feet. Measurement, 3,000 tuns. Diameter of cylinder 110 inches, stroke 12 feet, 2,800 horse power.

A NEW SUSPENSION BRIDGE.

The plans for a new suspension bridge over the Harlem river, at the high grounds in the upper part of New York city, have been prepared by the Park Commissioners. The bridge, as laid out on the drawings, will be about 1,800 feet in length, of which 734 feet will be within the jurisdiction of New York, and 1,066¼ feet in Westchester county. The roadway will be about 153 feet above high water level, and extend from the Tenth avenue to the hights on the opposite shore, west of the Croton aqueduct. It will be twenty-three feet higher than the present High Bridge, and form a convenient connection between the elevated lands of both sides of the river, affording favorable ground for foundations for piers and towers, and for anchorage for cables.

THE ELECTRICAL RAILWAY ALARM.

The bell rope commonly used on our railways, while it is very serviceable for short trains, is not of much use on long freight trains, because the weight and friction of a long cord is such that the rear portion of the cord may be broken without moving the forward portion. Thus, if the coupling of the rear cars of a long freight train breaks and the train separates, no alarm will be sounded on the engine gong, because the rear portion of the cord breaks while the front portion, to which the bell is attached, is not moved. An improvement which overcomes this difficulty consists in placing a magnetic bell hammer upon the engine, together with a small electrical battery, and in providing each car with a set of wires, joined by flexible joints, so arranged that while the train remains united all is well; but should any of the car couplings or wires break, the gong on the engine will instantly commence ringing. The same device may be employed by the conductor to give any signals that he may desire to the engineer, from any part of the train.

OLD AND NEW STEAM ENGINES.

The engines of the Cunard steamer *Scotia*, a large and splendid ship which plies between New York and Liverpool, are of 5,000 horses power, 100 inch cylinders, 12 feet stroke, very massive, elegant to look at, but of old style, side levers, entirely out of date, and very expensive to run. The ship burns 160 tuns of coal a day and requires 1,900 tuns for an Atlantic voyage. The new style of compound engines, now used on most of the ocean steamers, effects a saving of more than fifty per cent in fuel. Mr. F. J. Bramwell states that, nine years ago, the average consumption of fuel of the best marine engines was 4½ pounds of coal per horse power per hour, and that the same results are now obtained with a consumption of a trifle over 2 pounds of coal per horse power per hour. This is a wonderful improvement. The owners of the *Scotia* would make money by throwing away their present engines and substituting the new patterns. They might thus save 1,000 tuns of coal per trip, and add 1,000 tuns to the cargo capacity of the vessel.

THE COOLEST PLACE IN NEW YORK.

The coolest place to be found in New York in the summer time is the Pneumatic Underground Railway Tunnel, under Broadway, opposite the City Hall Park. When the thermometer stands at 90° in the shade on the street, if you go down into the pneumatic tunnel you find a temperature of only 65°. The projectors of this tunnel enterprise, which is pretty generally admitted to be the best plan for rapid city transit that has been presented, are obliged to wait the sanction of the State Legislature before proceeding any further with the work. Meantime that portion of the tunnel which has been constructed under Broadway continues open to the public and forms a cool, clean, well lighted promenade, being withal an interesting place to visit. A narrow gage railway track is laid in the middle of the tunnel, in which a comfortable passenger car sometimes runs, being propelled on the pneumatic plan with much success. The great earth-boring machine remains motionless in the south end of the tunnel, waiting the legislative voice to give it renewed activity.

PROMOTIONS AT THE PATENT OFFICE.

W. Burke, lately first assistant examiner in class 25 "Clay and glass manufactures," has been appointed Principal Examiner in class 121, "Steam."

J. Newland, lately first assistant examiner in class 126, "Calorifics," has been appointed Principal Examiner in classes 61 and 98, "Hydraulics and Pneumatics."

Both of these appointments are the result of competitive examinations which were highly creditable to the successful candidates. Both are gentlemen of ability, and their appointment to the higher position they now occupy gives general satisfaction. They are well qualified, zealous, and industrious officers.

DIAMONDS IN ARIZONA.

Fabulous stories are told in the daily papers concerning the recent discovery of emeralds and diamonds in Arizona. Large quantities of these precious stones, found by prospecting parties, have been carried to San Francisco and put on exhibition. A great area of the territory where they are found has been secured and several joint companies formed, based on great expectations in the acquisition of diamond wealth. The richness of the new fields is alleged to surpass those of South Africa, and the famous mines of Golconda are dwarfed into insignificance. If the half that is told of the Arizonian discoveries is true, real diamonds are about to become more common than the paste article, and the occupation of the artificial manufacturers will soon be gone. One of these companies, by name the San Francisco and New York Mining and Commercial Company, announces a capital of $10,000,000, of which a large proportion has been already taken. Probably a small amount of the stock yet remains unsold, which those who greatly want it can perhaps obtain, as a special favor, if immediate application is made.

The new diamond fields are located among the foot hills of the Pinal mountains in Arizona. The whole country round about is said to be rich in mineral wealth.

WHY IT HAS BEEN SO HOT.

The present summer has been characterized by unusual heats in almost every part of the Northern world, and all classes of philosophers, the weather wise especially, have been at their wits' end to account for it. Professor Tacchini has been making direct enquiries at headquarters, and has received the most satisfactory explanation. By means of spectrum observations and other carefully conducted experiments, he has discovered that for some time past our great luminary, the sun, has been throwing off immense and unusual volumes of magnesium gas from all parts of its surface. Magnesium is one of the most inflammable and fiercely burning substances in nature, when once set a-going, and the explanations of Professor Tacchini settle the whole matter. When the thermometer falls, it may safely be concluded that the supply of magnesium in the sun's atmosphere has diminished.

THE METEORS OF AUGUST TENTH.

The expected shower of meteors, predicted by the astronomers for August 10th last, did not make its appearance in the locality of New York. We observed few if any more meteorites on that night than on ordinary occasions; nor have we received reports from any quarter indicating that the earth went through the tail of any comet. It may be, however, that the plunge of our sphere into the cometary matter took place in the day time, the resultant meteors being then invisible.

TO RENDER METALS ELECTRIC.—T. Sidot has observed this phenomenon, and found that iron, silver, and aluminium, if the friction be sufficient, will give off electric sparks. To perform this experiment, take a perfectly dry tube of thick white glass and put in 15 to 20 grammes granulated silver, and 30 to 40 grammes pure bisulphide of carbon, and seal up the tube. On warming the tube slightly and shaking it in the dark, sparks appear in the interior, their number increasing with the violence of the agitation. The sparks disappear on immersing the tube in water.

CAUSTIC SODA.—A new method of preparing caustic soda is given by M. Tessié du Motay, in *Les Mondes*. One equivalent of sulphuret of sodium is mixed and fused with one equivalent each of caustic soda, hydrate of lime, and metallic iron (cast or malleable); when these substances are heated to redness. the sulphuret of sodium is completely converted into caustic soda, and sulphuret of iron formed. M. du Motay considers that the water of the hydrate of soda or lime is decomposed by the iron, which becoming oxidized, hydrogen is set free, oxide of sodium formed, and then sulphuret of iron; the soda being separated from the last named substance by lixiviation with water. In another process, the sulphuret of sodium is first converted into a basic phosphate of soda, and then into caustic soda by means of caustic lime.

The corporation of the city of New York have ordered a portrait of the late Professor Morse to be painted, to adorn the grand parlor, or Governor's room, of the City Hall.

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SCIENTIFIC AND PRACTICAL INFORMATION.

TO ENAMEL COPPER UTENSILS.

Finely pulverize 12 parts white fluor spar, 12 parts unburned gypsum, and 1 part borax, and fuse together in a crucible. When cold, mix with water to a paste, and apply to the interior of the vessel with a paint brush. When dry, the vessel should be thoroughly baked in a muffle or furnace.

MESMERISM.

Mr. J. E. E., of Pa., says: "About six months ago a mesmerizer was performing in this place for about a week. Our nearest neighbor's little daughter, a pretty bright child, became a very interesting subject: and during the stay of the professor was nightly under his influence, sometimes for two hours. Her mind seemed in a strange way the day after he left, and in two days she was taken with a severe headache with darting pains; these terminated in a stupor, and, for about six months, she has been under medical treatment. The physicians say she has no disease. The poor child is an object of pity, having pined away to a skeleton and become perfectly helpless and idiotic. She does not know her own wants; never asks for food, merely opens her mouth when it is touched, and takes it like a young bird."

FIREWEED FIBER.

In reference to this product, described on page 89, current volume, our correspondent, Mr. I. Stauffer, says:

"The plant known as fireweed, which springs up in clearings when recently made and burned over, is the *Erechthites hieracifolia, Raf.* This belongs to the natural order *compositæ*, and the numerous *achenia* in the receptacle, provided with a copious pappus of very fine and white hairs, might be compared with the boll of the cotton plant. But the writer says it is called *epilobium;* of this we have 5 species: the *epilobium angustefolium*, L. (great willow herb) attains a hight of from 4 to 7 feet, and is often very abundant in newly cleared land. This gets fine flowers in a long spike or raceme. The pod is linear, many seeded, each seed with a tuft of long hairs at the end. The epilobium belongs to the natural order *onagraceæ* (the evening primrose family). I doubt not but that the fiber of the bark would be useful for the purposes of "wicks, ropes, yarn, and even paper." I know that our common evening primrose, *œnothera biennis*, with which I have seen neglected fields completely covered, is suffered to rot as a weed, simply from ignorance of its value."

WATER FROM THE BOTTOM OF THE SEA.

A German inventor suggests the use of a vessel, lowered by a rope and provided with a wire which, by electrical action, closes the vessel when the required depth has been reached. The idea is simple and appears to be practicable; and some valuable results may be obtained by drawing up water from various depths in the sea.

APPEARANCE OF FOREIGN GRASSES IN FRANCE.

The growth, apparently spontaneous, of several foreign species of grass in middle France, especially in the communes of Cour and Cheverny, has been explained by M. Vibraye in *Les Mondes*. It appears that, wherever the cavalry horses had been supplied with forage from Algeria, numerous grasses unknown to the locality were growing, as many as twenty new kinds already having been observed. A gentleman has noticed as many as forty four unknown species in the neighborhood of Angoulême, which all appeared immediately after the presence of a cavalry camp in the suburbs. The avidity with which the new plants have taken root has induced the Academy of Sciences in Paris to authorize the preparation of a scheme for the systematic introduction of Algerian forage plants into France.

[Special] Correspondence of the Scientific American.]

LETTER FROM PROFESSOR R. H. THURSTON.

A flying visit to Chicago," the Cream City," and St. Paul. The St. Louis River and its remarkable characteristics. Important railway engineering. Duluth, its astonishing growth. Houghton and the Lake copper regions.

HOUGHTON, Portage Lake, Mich., July 17, 1872.

Leaving St. Louis soon after sunset, we next morning found ourselves rapidly but smoothly riding across the level, treeless prairies of Northern Illinois, the view strongly reminding one of that obtained from a ship's deck in open ocean on a calm day—a monotonous dreary sameness bounded in every direction by an equally distant line, the apparent line of meeting between heaven and earth.

At eight o'clock A. M. we were landed in Chicago and rode across to the Northwestern depot through a portion of the "burnt district." We were thus enabled to obtain a glance at the terrible desolation which so suddenly overspread a large portion of this great city, and to see something of that phœnix like revival which the wonderful energy of the people, assisted by the substantial sympathy of every civilized country, has inaugurated. We must spend more time here on our return from the great northern lake.

MILWAUKEE.

After a substantial breakfast, we again started northward, passing through Milwaukee, one of the most interesting cities of the northwest and one which promises to become the seat of extensive manufactures in iron. "The Cream City," as it has been called, has a fair harbor at the mouth of the Milwaukee river; extensive water power is afforded by the river, and lines of steamers and railroads assist in making the city one of great importance and of promising future. It is scarcely more than twenty years since the city was founded, and, yet, in 1870, it contained 71,464 people.

From Milwaukee, our route took us through a country which, as we went northward, gradually lost the prairie character and became irregular in surface and more and more wooded; and as one pleasant scene succeeded another, and as we crossed one fine farm after another, we thought these Minnesota lands the finest we had yet seen.

ST. PAUL.

A day and a night on the rail, and we finally reached St. Paul, the capital of Minnesota, a city of about 25,000 inhabitants, standing upon a high bluff at the head of navigation of the Mississippi river. A quarter of a century ago, there were, where the city now stands, perhaps a dozen dwellings, whose inhabitants were trading with the Dakotas or the Chippeways, and hunting and fishing in the neighboring forests and in the beautiful streams flowing through them. To-day, with its 25,000 people and their well built residences and frequently imposing stores and public buildings, its four miles of water front from which steamers can take their cargoes without difficulty to New Orleans, 2,060 miles below, and with the lines of railway which radiate in all directions and connect the city with every part of the country, with its healthy climate and surrounded, as it is, with a fine farming country, St. Paul is an excellent place in which to build up a manufacturing industry, and its future should be one of exceptional prosperity.

The cities of Minneapolis and St. Anthony are a short distance above St. Paul, at the falls, and seem equally prosperous. They have an additional advantage in the possession of immense and readily utilized water power. The former has already become known as the seat of woollen manufactures; and the blankets woven there are among the very finest in our markets.

ON TO DULUTH.

We made but a short stay here and then started for Duluth *viâ* the Lake Superior and Mississippi Railroad. This road passes, for the greater part of its length, through a rather uninteresting country; but, at Thompson, we crossed the St. Louis river, and thence the road was carried along its banks nearly to Duluth.

DIFFICULT RAILWAY ENGINEERING.

It was during our ride along the banks of the St. Louis that we saw at once some of the most beautiful scenery and the most difficult engineering that we had met with since leaving home. The rails are carried on high trestles across deep ravines, and for long distances along the high bank of the river and at points, the road bed seems almost ready to slide into the stream. The work is, however, well done, and the greatest care is taken in running trains over the more dangerous portions of the road; there is really very little risk, much less than on many roads where the natural obstructions are far less formidable, but where the engineering is less skilfully done.

A GREAT WATER POWER.

The river, from Thompson to Fond du Lac, where it enters Lake Superior, presents an almost uninterrupted succession of falls and rapids.

In the last eight miles, the river falls about 400 feet and, as the rate of flow has been stated to be 290,000 cubic feet per minute. it is not improbable that this stretch of the river offers an available power of not less than 100,000 horses,—enough to drive 10,000,000 spindles, could it be applied to cotton manufacturing. It is a large cotton mill that contains 50,000 spindles; this water power is thus capable of supplying 200 large mills. The rocky bed and precipitous banks of the river are slate, and this stone, together with the excellent lumber of the adjacent forests, is quite sufficient to support a large industry for an immense length of time. The amount of capital which may be usefully and profitably employed here can hardly be imagined. The valley must at some future time support a large population, and a beginning has already been made at Thompson, where there are several saw mills, railroad shops, and other manufacturing establishments.

THE "DALLES" OF THE ST. LOUIS.

But, as the traveller rides over this eight miles along the "Dalles" of the St. Louis, even although he may be the most thoroughly utilitarian of capitalists or engineers, he can hardly, at his first visit, so far control his feelings as to be able to speculate, upon the probable available power of the stream or the value of its slate deposits and bordering forests, while in their actual presence. Nature here presents such scenery as is rarely found either at home or abroad. It has none of the grandeur of Niagara or of the Yosemite, but in its wild beauty, in its picturesqueness, and in the variety of its scenery, it can have but few rivals. The Dalles present a collection of attractions that will repay the lover of Nature for all the fatigue of a journey across a continent. Here, for miles and miles, the river rushes between precipitous banks over its rocky channel, and rapids and falls and rapids again follow each other in constant succession. Occasionally the banks recede, and the river widens and becomes a wide but shallow and brawling stream; again the banks approach each other and high precipices confine the river in a narrow bed where it roars among craggy slate dykes or rushes over a succession of cascades to a lowel level; here it, perhaps, flows more quietly for a little time, but soon it resumes its wild career, and finally loses itself in the calm depths of Lake Superior.

THE NEW CITY OF DULUTH.

Duluth, where we were to take a steamer for the lake ports, is one of those typical western "cities" which frequently spring up as if at the command of the slave of Aladdin's lamp. Hardly three years old, it already contains eight churches, two hotels of moderate size, several saw mills, and a considerable number of stores. An opera house and another hotel are promised. The North Pacific Railroad is building long lines of wharf in a very good harbor. This has been rendered readily available by cutting a ship canal through Minnesota Point, which stretches out six miles across the bay toward Superior city, and makes the best possible breakwater. A capacious elevator has been erected at the landing. There are probably 4,500 people in the place. This is the terminus, on Lake Superior, of the great Northern Pacific Railroad. Its connection by rail with all parts of the country and its several lines of steamers, which keep it in regular communication with all the ports of the great lakes, are advantages that must rapidly build up the city. Still, when land sells, as it has here within a few days, at eighty dollars per front foot, we are somewhat inclined to believe that the youthful city is suffering from an inflation of prices in its real estate market that must retard its growth. The buildings are generally framed structures and of rather rough construction, as might be expected. An occasional brick building and at least one brown stone front may be seen in the upper town.

This town, springing up as it has, reminds one of those which, during the war, were occasionally built by the army, not only by the rapidity with which this peaceful army has erected its quarters, but, in some places, by the character of the buildings.

THROUGH THE LAKES TO THE COPPER REGIONS.

After waiting two days at Duluth, the steamer *Meteor* came into port and we sailed next morning. We had a clear bright day, with a warm sun but a cool air, and enjoyed the sail extremely. By the middle of the afternoon, we were steaming through that beautiful group, the Apostle Islands, and, just before sunset, touched at Bayfield, a village on the south shore of the lake. As we left the shore again and headed for Isle Royale, we witnessed a magnificent sunset; such brilliancy of color and such variety of cloud shapes no Italian sky could surpass.

We arrived, next morning, at Isle Royale, where we took on board a prospecting party returning from an exploration of the copper deposits of the island. These deposits are quite extensive and are supposed to be at some points extremely valuable. They were formerly worked by several companies; they are now nearly all held by a single corporation, and operations which have, for some time, been entirely suspended, will probably, ere long, be resumed. It is not improbable that this island may be found to contain an immense amount of mineral wealth, if we may judge by its geological structure and by the evidence afforded by explorations and workings which have already been commenced.

Once more steaming out of harbor, we again headed southward, and, at evening, by the light of the full moon, we were skilfully piloted through the long, tortuous entrance to Portage Lake, and late at night came alongside the wharf at Houghton, the principal town of the Lake Superior Copper Regions. Here we propose spending some days for the purpose of learning something of the character of these deposits, and the methods adopted in "winning" the ores.

R. H. T.

18,000 Blows a Minute

Can easily be given with our new machine for reducing

SEWING MACHINE NEEDLES.

It is universally acknowledged to be the best and most practicable machine ever invented for reducing metals; doing the work very much faster than any other machine, and it will run for years without any perceptible wear. Our machines are operated on an entirely new mechanical principle, discovered by Mr. Hendryx—a principle which produces the most perfect mechanical arrangement for a rapid motion ever yet invented; the dies can be made to strike twenty thousand positive blows a minute.

We are now prepared to furnish our machines at a reasonable price, to any or all parties who may want a very superior machine for reducing sewing machine needles, for pointing wire, for wire drawing, or for swaging any articles where a very rapid stroke is required.

Sewing machine needle makers will find it greatly to their advantage to call on us and see our machine in operation, as the introduction of our machine into the art of needle making will cause the plan of swaging needles to entirely supersede the old plan of milling, for it not only makes a great saving in the cost of making the needles, by greatly lessening the cost of reducing them, besides saving more than half of the wire used in making milled needles, but the process of swaging makes a needle which is far superior to a milled needle—for, in reducing needles by the milling process, all of the best of the wire, the outside, is cut off and wasted, the poorest part of the wire, the core, only being used; while the swaging process, by condensing the particles of metal, makes the part of the needle which is reduced far superior to the wire itself.

Our machine is fully covered by good valid patents in this and foreign countries. Communications by mail will receive prompt attention. Call on or address Webster & Hendryx, Ansonia, Conn.

Facts for the Ladies.—J. A. H. Abell, Warsaw, N. Y., bought a Wheeler & Wilson Lock-Stitch Machine in 1857; used it 9 years in stitching clothing that 8 hands prepared, and since in family sewing, with not a cent for repairs; it runs now like magic, with no signs of wear. See the new Improvements and Wood's Lock-Stitch Ripper.

Merit is its Own Success.—Superior merits and capabilities, cheapness in price, and ease of operation, have placed the New Wilson Under-Feed Sewing Machine far in advance of all other machines in the market. The public shows its approval of all that it is and does by purchasing the machines as fast as the company can possibly manufacture them. There is no test of a sewing machine ever yet inaugurated but what has been used on the Improved Wilson, and in every case it has come off ahead of every other machine in use. No pains or expense is spared in the material used in it, or the workmanship of its construction, to make the Wilson every way the best, most pleasant, and most durable sewing machine in existence. It costs but $50, and is sold on easy payments. Salesroom, 707 Broadway, New York; also for sale in all other cities in the United States.

NEW BOOKS AND PUBLICATIONS.

EASY RULES FOR THE MEASUREMENT OF EARTHWORKS by means of the Prismoidal Formula. Illustrated. By Ellwood Morris, Civil Engineer. Philadelphia: T. R. Callender & Co., Third and Walnut Streets.

This is a well arranged treatise on the subject announced in its title page; and it provides for the calculation of earthwork of all kinds by an elaborate compilation of formulæ and tables.

THE MUSICAL WORLD. Henry Litolff, 211 Fourth Avenue, New York city.

This publication contains, in each issue, a number of songs, reprinted in a clear and legible manner, the selection being judiciously made from composers of known ability.

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Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed four Lines One Dollar and a Half per Line will be charged.

Flouring Mill near St. Louis, Mo., for Sale. See back page.

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin. $4 00 a year. Advertisements 17c. a line.

Wanted—A Situation to superintend work, by a Machinist of considerable experience. Address "Machinist," carrier 98, Philadelphia, Pa.

For Sale—Retiring Partner's interest in a Sash, Door and Moulding Mill, located at one of the best points in the Northwest, and doing a large trade. A good opening to a paying business. Address "Mill Co." care Cook, Cobourn & Co., Chicago, Ill.

Baby's Carriages—Send illustrated circulars of to a purchaser. Address Lock Box 304, Pittsburgh, Pa.

Griffith & Wedge, Zanesville, Ohio, are the only Builders of the Vertical Portable Engine, and their unequalled Saw Mill. H. Fairbrotner says, July 21st, 1872, "I am making the Pine dust fly at the rate of Twenty thousand feet per day."

The best Portable Engine in the World is Griffith & Wedge's "Vertical." E. Boston says, August 5th: "Engine works first rate with any kind of green wood; the trouble is to keep the Steam down to 70 pounds, which is all we need. Hard Pin Oak, 25 in. cut, does not check it."

For Best Fish Net Machines—Lewis & Ward, 73 Commercial Street, Boston, Mass.

Valuable Invention for Sale, Pat'd. Box 116, Providence, R.I.

Woodworth Surface Planers, $125. Planers and Matchers, $350. S. C. Hills, 32 Courtlandt Street, New York.

Wood Lathes, all Sizes. Wm. Scott, Binghamton, N. Y.

See Mill Spring adv. to Millers and Millwrights, back page.

Turbine Water Wheels—Two twenty-four inch Reynolds Wheels—less than one year's wear and as good as new—for sale cheap. For further information, apply to J. G. Parker & Son, Poughkeepsie, N. Y.

Patent Steel Measuring Tapes, made and sold by W. H. Paine, Greenpoint, N. Y. Send for circular.

American Boiler Powder Co, Box 797, Pittsburgh, Pa., make the only safe, sure, and cheap remedy for 'Scaly Boilers.' Orders solicited.

A foreign patent of unusual merit for sale on liberal terms or on comn ission. Address G. T. W., Post Office, Baltimore, Md.

A Rare Chance—Pleasure Steamboat for $275.00. Length, 16 feet; speed. 6 miles an hour. Address Geo. F. Shedd, Waltham, Mass.

Bogardus Mills—Two number 5 and five number 3, for sale cheap. Address B. G., 112 John St., New York.

Whitcher's Pat. Rotary Engine is the simplest, cheapest, and most economical. On exhibition at P. Fields & Son, North Point Foundry and Machine Works, Jersey City, N. J.

Platina Plating—Alb. Lovie, 729 N. 3d St., Philadelphia, Pa.

Wanted—A number of Rotary Engines. Dealers, please address J. D Butler, Lancaster, Mass.

Windmills: Get the best. A P. Brown & Co., 61 Park Place, N.Y.

Sweetser's Blacking and Brush Holder—illustrated in Sci. American. May 18, 1872. Best thing for Stove or Shoe Blacking. Needed in every household. Rights for sale. E. H. Sweetser, Box 317, Salem, Mass.

It is better to purchase one of the American Twist Drill Company's Celebrated Patent Emery Grinders than to wish you had.

Presses, Dies & all can tools. Ferracute Mch Wks, Bridgeton, N. J. Also 2-Spindle axial Drills, for Castors, Screw and Trunk Pulleys, &c.

New Pat. Perforated Metallic Graining Tools, do first class work, in less than half the usual time and makes every man a first class Grainer. Address J. J. Callow, Cleveland, Ohio.

Gear Wheels, for Models; also Springs, Screws, Brass Tube Sheet Brass, Steel, &c. Illustrated Price List free by mail. Goodnow & Wightman, 23 Cornhill, Boston, Mass.

Steam Boiler and Pipe Covering—Economy, Safety, and Durability. Saves from ten to twenty per cent. Chalmers Spence Company foot East 9th Street, New York—1202 N. 2d Street, St. Louis.

Brick and Mortar Elevator and Distributor—Patent for Sale. See description in Sci. American, July 20, 1872. T. Shanks, Lombard and Sharp Streets, Baltimore, Md.

The Berryman Manf. Co. make a specialty of the economical feeding and safety in working Steam Boilers. Address I. B. Davis & Co. Hartford, Conn.

The Berryman Heater and Regulator for Steam Boilers—No. one using Steam Boilers can afford to be without them. I. B. Davis & Co., Hartford, Conn.

Diamonds and Carbon turned and shaped for Philosophical and Mechanical purposes, also Glazier's Diamonds, manufactured and reset by J. Dickinson, 64 Nassau st., New York.

Wanted—Melter. Permanent situation, at good wages, to a good, experienced Iron Melter. Address C., Iron Founder, Cleveland, O.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable. W. D. Andrews & Bro. 414 Water st., N.Y.

For Machinists' Tools and Supplies of every description, address Kelly, Howell & Ludwig, 917 Market Street, Philadelphia, Pa.

Machinery Paint, all shades. Will dry with a fine gloss as soon as put on. $1 to $1.50 per gal. New York City Oil Company, Sole Agents, 116 Maiden Lane.

Williamson's Road Steamer and Steam Plow, with Rubber Tires. Address D. D. Williamson, 32 Broadway, N. Y., or Box 1809.

Belting as is Belting—Best Philadelphia Oak Tanned. C. W. Arny, 301 and 303 Cherry Street, Philadelphia, Pa.

Boynton's Lightning Saws. The genuine $500 challenge. Will cut five times as fast as an ax. A 6 foot cross cut and buck saw, $6. E. M. Boynton, 80 Beekman Street. New York, Sole Proprietor.

Better than the Best—Davis' Patent Recording Steam Gauge Simple and Cheap. New York Steam Gauge Co., 46 Cortlandt St., N. Y.

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

For hand fire engines, address Rumsey & Co., Sneca Falls, N.Y.

All kinds of Presses and Dies. Bliss & Williams, successors to Mays & Bliss, 118 to 122 Plymouth St., Brooklyn. Send for Catalogue.

To Ascertain where there will be a demand for new Machinery, mechanics, or manufacturers' supplies see Manufacturing News of United States in Boston Commercial Bulletin. Terms .00 year.

The best recipes on all subjects in the National Recipe Book. Post paid, $2.00. Michigan Publishing Company, Battle Creek, Mich.

Mining, Wrecking, Pumping, Drainage, or Irrigating Machinery, for sale or rent. See advertisement, Andrew's Patent, inside page.

For Hydraulic Jacks and Presses, New or Second Hand, send for circular to E. Lyon, 470 Grand Street, New York.

Peck's Patent Drop Press. **For circulars address the sole** manufacturers, Milo, Peck & Co., New Haven, Ct.

For Marble Floor Tile, address G. Barney, Swanton, Vt.

Old Furniture Factory for Sale. A. B., care Jones Scale Works, Binghamton, N. Y.

Portable Baths. Address Portable Bath Co., Sag Harbor, N.Y.

For Steam Fire Engines, address R. J. Gould, Newark, N. J.

Notes & Queries.

[We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers.

1.—DIAMONDS.—Will some one of your readers tell me how to detect a diamond, and in what way to test its value?—C. W. P.

2.—COLORING INDIA RUBBER.—I would like to enquire if soft rubber can be colored throughout a bright and durable green, brown, yellow or other color?—C. L. P.

3.—PAPIER MACHE.—What is the process for making this substance, and what is put in the pulp to harden it?—W. R. F.

4.—SOLDERING LEAD.—Can any one tell me what is used by plumbers in joining lead?—J. C. H.

5.—CEMENT FOR IRON.—Is there any cement, in use in machine shops, for sticking iron together? If so, how is it made?—J. H. S.

6.—ROTTING STRAW.—What cheap chemical must I apply to straw in stable refuse to rot it quickly? I want something that will not affect brick or stone work.—C. DE P. F.

7.—VALUE OF PURE GOLD.—What is the value in coin of gold, 24 carats fine?—S. A. G.

8.—SMELTING LEAD, COPPER, GOLD AND SILVER.—H. S., of Ill., desires to know where good modern treatises on the subject can be obtained. There are several published, but the publishers keep them away from our advertising columns as much as possible.

9.—ELIMINATION OF MERCURY FROM TIN AMALGAM.—How can I obtain pure mercury from the coating on the backs of looking glasses?—J. H. M.

10.—CEMENT FOR MEERSCHAUM.—Can anyone tell me how to prepare a cement to mend a (colored) meerschaum pipe?—E. S. T.

11.—DRILLING HOLES IN GLASS.—Can any one give me practical directions for drilling holes in glass?—W. V. B.

12.—BOILING OIL.—Can steam be used, to replace a coal or coke fire, for boiling oil or other liquids requiring a heat of from 300° to 400° Fah?—V. L.

13.—INDIA RUBBER FOR STEAM TIGHT JOINTS.—Can india rubber be exposed to the heat of steam and iron without injury, being used as a washer or in place of an ordinary valve in immediate connection with a steam boiler?—V. L.

14.—DYEING ANILINE BLACK.—How is the aniline black, the preparation of which is described on page 101, current volume of the SCIENTIFIC AMERICAN, used in dyeing?—E. T. H.

15.—WOODEN RAILWAYS.—E. O. N., of Tenn., repeats the questions asked by C. M. P., query 17, page 106. Will Mr. J. B. Hulbert give the public some light on the plan he has adopted?

16.—THE VIENNA EXPOSITION.—T. C. P., of Mass., and others enquire who is our government agent for securing space and forwarding articles for exhibition at Vienna. If any appointment or arrangement has been made, it has hitherto been kept out of the public mind.

17.—CUTTING PLATE GLASS.—I have a plate of glass three tenths of an inch thick and two and a half feet wide, which I wish to cut without risk of breakage. A light diamond cuts it, but not surely. What means shall I use?—J. P. A.

18.—PRESERVING THE EYESIGHT.—Some years since much was said in relation to preserving the sight in old age by pressing the eyeballs. If anyone of your readers has received benefit from such treatment, he will do a vast amount of good by giving the particulars through your paper.—J. H. D.

19.—WATER VERMIN.—In your issue of August 10, page 84, I find a communication from W. Ward, Cleveland, O., on how to destroy wigglers. I am troubled with a similar pest. The cistern water is swarming with small reddish-colored bugs or lice; they crawl, and are very lively in the water, and are about one thirty-second of an inch in size, and smaller. The cistern was cleaned about three and a half months ago, and we have only noticed them for three weeks past. What can they be, and what is the best way to get rid of them?—A. H. R.

20.—NITRO-GLYCERIN.—Will some one please give me a formula for making nitro-glycerin?—P. G. S.

21.—BRONZING.—How can I bronze small castings in a simple and effectual manner?—L. H. W.

22.—PRESERVING POLISHED STEEL SURFACES.—We have seen it stated that carbonate of soda is found to be effective in preserving polished steel surfaces from oxidation. Can you inform us what solvent is used and how applied?—F. & N.

23.—VERMIN IN DRIED FRUITS.—How can I keep worms out of dried cherries and raspberries?—M. S.

24.—CEMENT TO RESIST WATER AND ALCOHOL.—Can any of your correspondents furnish me with a recipe for a cement to resist the action of both water and alcohol, which must possess sufficient elasticity so as not to crack and peel off?—F. S.

25.—WHALES AND FISHES.—I believe the notion prevail among scientific men, as well as among sailors, that the *cetacea*, an order of animals including whales, porpoises, etc., exhibiting a high degree of animal heat and exhaling an elastic fluid resembling air, though living only in water, are not fishes, but species of mammalia that breathe air like land animals. I have had many opportunities of watching the ways of these animals, and have caught a great many porpoises of different varieties; and these questions have occurred to me: 1. How am I to account for their sudden appearance and disappearance at long intervals, often in vast numbers, sometimes beneath the surface without touching it? 2. Can any one explain the fact that they never inspire? Their breath is invariably a more or less prolonged exhalation; while the inhalation of the seal and the turtle is easily distinguished from the short, feeble puff that precedes it. 3. How is it that they cannot live out of water? In fact, they die sooner than fishes generally when they are taken out of water. And, like fishes, when deprived of the power of locomotion, they will soon die even in the water. Their anatomical structure, I believe, does not admit of that bellows-like motion so necessary to the process of respiration in air breathing animals. 4. What is meant by "warm blooded animals"? Have certain animals a constant fixed degree of animal heat, while all others are variable according to the temperature of the surrounding elements in which they live? Or are not all animals, including fishes, more or less warm blooded? 5. In catching fish, such as cod, bream, etc., in deep water, say thirty fathoms or more, they usually come to the surface in the condition that fishermen call being poke-blown, the abdomen being distended to its utmost capacity, and a portion of the viscera protruding from the mouth, the whole fish inflated with some elastic fluid. Now what is this fluid? And how does it get there? May not the explanation of this phenomenon afford a clue to answer some of the preceding questions?—G. W. G.

Answers to Correspondents.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at $1·00 a line, under the head of "Business and Personal."

ALL reference to back numbers must be by volume and page.

BURSTING OF SAWS.—G. A. H. is informed that no such accident as he mentions has ever occurred within our knowledge, nor do we think it is possible to burst a saw by running it at any velocity.

TOY BALLOONS.—A one line advertisement would obtain J. F. O. S. the information he seeks. See notice at the head of this column.

GREEN WALL PAPER.—J. S. G. is informed that the deleterious effects of green wall paper are most noticeable in rooms lined with flock paper, from which particles of wool, with, of course, the green coloring matter, are constantly getting detached. Green paint is not so hurtful, and the idea of varnishing it is a very good one.

DUPLICATING DRAWINGS.—W. R. F., of Mass., is informed that the sensitized paper mentioned in M. Rénault's process is not photographic paper, but a chemically prepared material manufactured, we believe, in Paris.

APPARENT DIAMETER OF THE PLANETS.—* * *, of Mich. sends us a communication with a sketch showing the apparent diameter of the planets, "as they would appear to the naked eye were the excess of light removed so as to render their disks visible." Our correspondent appears to be unaware that it is not possible to give a drawing which shall represent the apparent diameter of any body. A drawing of the moon may just as well be 12 feet in diameter as 12 inches; neither of these measurements can give any idea of the size of the moon as it appears to the eye. In a painting of a landscape, there is a proper diameter for the sun or moon, as the question of proportion to the trees and other objects represented then comes in. But without this opportunity for comparison, it is impossible to give any idea of the size of a heavenly body.

MILDEWED SAILS.—H., of N. J., should soap the mildewy spots, and then rub in powdered chalk. The growth of the mildew fungus can be prevented by steeping the canvas in an aqueous solution of corrosive sublimate (bichloride of mercury).

THE WEIGHT OF THE ATMOSPHERE.—If an airtight chamber is able to hold 500 pounds weight above the water, will it be able to carry more in case the air be pumped out of the chamber?—S. R. Answer: Yes; the chamber will carry more if exhausted than if filled with air. Every 100 cubic inches of air, the barometer being at 30 inches and the thermometer at 59° Fah., weighs 31 grains avoirdupoise.

HAIR DYE.—To G. H. J., page 106.—Solution No. 1: Dilute solution of nitrate of silver. Solution No. 2: Solution of sulphide of ammonium or sulphide of potassium. Comb one solution through the beard carefully, and then use the other in the same way.—E. H. H., of Mass.

FRICTION MATCH COMPOSITION.—C. B., page 106.—The following I have frequently made, and know to be good. I presume you know the *modus operandi* in making or mixing. Phosphorus, 34 parts; nitrate of potash, 50 parts; chlorate of potash, 26 parts. red lead, 43 parts; best glue, 42 parts.—E. H. H., of Mass.

TEMPERATURE OF ICE HOUSE.—J. C. McC., page 106.—The radical fault with your ice house appears to have been the wet sawdust; it should have been dry sawdust, a very fair nonconductor of heat, whereas the wet would infallibly cause the unfortunate result. There should be no ventilation whatever, especially at the top. Any water from the melting ice should have a chance to get away, so as not to remain in contact with the lumps.—E. H. H., of Mass.

SPONTANEOUS COMBUSTION.—To W. F. C. S., page 106.—The cases you relate were most undoubtedly of spontaneous combustion, and the college professor must have been lamentably ignorant of common things to have made the statement he appears to have done.—E. H. H., of Mass.

PURE VINEGAR.—To J. E. H., page 106.—Most certainly vinegar can be, and is, manufactured perfectly free from the little eels, etc., you speak of. If a vinegar is properly and carefully made—no matter from what material—it will be perfectly clear, bright, and free from animalculæ. If it be thick and muddy, it is owing to careless treatment, and is almost sure, sooner or later, to breed the eels. A perfectly sound good vinegar can be made in less than forty-eight hours, and better than that generally made to take from seven to nine days in production.—E. H. H., of Mass.

EXTINCTION OF CAB LAMP ON A LOCOMOTIVE.—To W. F. C. S., page 106.—Probably it is caused by the peculiar vibration of the air resulting from a particular note produced by your whistle. If you modify the note, so as to be either considerably above or below its present pitch, very likely the lamp will not be put out. If you try the experiment, I should like to know the result. I suppose the note or sound may be modified by increasing or diminishing the aperture through which the steam escapes, or else by attaching a different cup on top, or perhaps placing something on the present one.—E. H. H., of Mass.

SETTING BOILERS.—To J. D. H., query 16, page 106.—The cause of your carbon explosions is that you do not admit air enough to burn it as fast as it accumulates. You should leave your ash pit door more open, and pack your fuel less closely, or admit air through a damper in the furnace door; if there be no damper in the door, drill a dozen half inch holes or leave it a little open. There is no harm in admitting more air under the grate unless you wish to burn your fuel in the ash pit. Keep your chimney damper wide open while running.—A. L., of Mass.

RED ANTS.—Query 23, page 90.—If J. C. W. will sprinkle finely powdered borax about freely in his cupboard, I think he will not be troubled in the future with red ants.—J. C. E., of O.

TEETH IN WHEELS FOR CHAIN BELT.—M., query 6, page 90. is correct in saying that "different wheels require different spacing for the same chain," if he spaces from one tooth to the next at one stride of the dividers, which is an incorrect method. The simplest way is to first ascertain the precise length of a link between the centers or pivots, and then set your dividers and space around on the pitch line. This being done, rub out every other point; the remaining points will be the correct centers for the teeth. This rule will be found correct, no matter how large or small the wheels may be.—G. B. D., of Ill.

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Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

LAST.—Nathan M. Rosinsky, of New York city.—This invention consists n attaching the heels of such shoes as are known in the trade as turn shoes to the soles before attaching the uppers, and in afterwards securing the uppers, either in whole or around the heel only, by headed nails driven from the side which becomes the inside of the shoe after it is turned; whereby the soles are secured very firmly, as the nails have heads at one side and are riveted at the other by being driven against a metal last; or long nails are used at the heel, so as to fasten it from both ways. Besides fastening the soles better, the nails will not hurt the feet, as they are likely to do in the ordinary method.

SPINNING WHEEL.—James Cochran, Jr. of Cornwallis, Nova Scotia.—This invention provides an improved method of support and fastening for a hand spinning machine, by which it may be adjusted on the edge of a table in positions for the operator to either stand or sit, the same clamp answering in either case.

HOPPER FOR BAG HOLDERS.—Warren Wasson and George W. Dungan, of Genoa, Nevada.—This invention consists in the construction of grain hoppers fo bag fillers and other apparatus, of rawhide or leather stretched on a wire or other frame; the rawhide or leather is in one piece and formed in the shape of a common wood hopper within the frame, and is provided with a hole at the center of the bottom for the escape of the grain. The hopper s coated with waterproof paint and varnish, so as to make a smooth hard surface and protect it against moisture.

FEED CUTTER.—Samuel Holl, of Reading, Pa., assignor to himself and Jacob Holl, of same place.—This invention relates to an improvement in the class of feed cutters wherein the cutter has a compound or planetary motion. In the present arrangement the cutting is effected by a circular or disk knife, which by means of suitable gearing is not only rotated on its iron shaft but is carried round the main shaft by an arm; it is so adjusted that it passes before the feed rollers and does its work as it descends. The invention also consists in a modified arrangement of the feeding apparatus.

PEANUT PICKER.—Samuel C. Fewell and George Baars, of Beardstown, Tenn.—The first part of this invention relates to breaking off or picking the nuts from the plants by means of two cylindrical rollers which are so arranged, in close proximity but not in actual contact, that when revolved in opposite directions they fasten upon and force between them the soft and yielding plants, but cannot so fasten upon and pass the nuts. The second part relates to the final separation of the nuts from the plants after they are picked off by means of two carrier belts, which are so arranged, one above the other, that the upper belt receives the denuded plants, as they come from the picking rollers, and carries and discharges them at a remote point, while the lower belt receives the nuts at the same time, and carries and discharges them at a point less remote in the machine. The third part relates to cleaning the nuts from dust, leaves, or broken stems by means of an inverted fan, by the action of which the nuts, in falling into the chute that discharges them from the machine, are exposed to a strong current of wind.

ELEVATOR BRAKE.—Theodore Thorn, of St. Clair, Pa.—This invention is an improvement in the class of brake attachments for elevators wherein wedges are employed, and it consists in the construction following: The brakes are connected by flat steel springs, by means of which they are also forced apart and made to operate. To the centers of the springs are attached rods which are connected with the central lifting block, as are also the brake blocks; by which construction, when the car is raised, the springs are drawn up in the centers, and the brake blocks drawn up to the car corners. Should the supporting chain break, the released springs would straighten themselves and force the brake blocks against the corners of the frame, where they would become safely wedged by the weight of the car.

BRIDGE.—John Johnson, of Mott Haven, N. Y.—This invention furnishes an improved mode of building arched bridges and other arched structures, which is simple, convenient, and effective, and enables an arch of any desired span to be formed without previously constructing a form or guide frame; it consists in supporting the arch in process of construction by two or more pairs of suspended cables, and in combining with the main arch a secondary one, the blocks of which are formed with tenons which interlock with the cross beams of the main arch.

LATH MACHINE.—Samuel M. Palmer, of Glen's Falls, N. Y.—This invention furnishes an improved lath machine, which is simple, convenient and effective. It is so constructed as to bring the machine fully under the control of the operator, so that he can easily regulate the rapidity of the feed without stopping the machine, and instantly stop the feed when desired.

TUMBLER FOR POLISHING FORKS, ETC.—Hilon Bump, of Wallingford, Vt., and Alexander H. Ritchie, of New York city.—This invention furnishes an improved tumbler for polishing forks, etc., which is so constructed as to furnish no cracks or crevices for the points of the forks to catch in and be broken, thus protecting the manufacturer against the loss from breakage in polishing in tumblers constructed in the ordinary manner; it consists in grinding the ends of the tumbler barrel and the main hole cover to their respective seats so as to form perfectly close joints.

SEED AND GUANO DISTRIBUTOR.—William J. West, Greenville, S. C.—The invention consists in providing a seeder hopper with a pendent swinging shoe, whereby the grain and guano are held until said shoe is tilted, shaken and caused to distribute it; in providing the shoe with a leather or other tube placed centrally at the conveying end so as to place the seed always in the middle of the furrow: and in a plumb, so placed as to enable the operator always to know when he has the shoe at the proper inclination. This machine is manufactured by the firm of Gower, Cox and Markley, Greenville, S. C.

BAG HOLDER.—Thomas Jefferson Trapp, Williamsport, Pa.—The invention consists in providing a bag holder with a shank tapering on the rear side so as to throw the mouth of the bag on a decline toward the front, and with an auxiliary stem guide; in providing the jointed arms with edge flanges so that one arm may slide within the other, with ratchet and pawl to hold them at different degrees of expansion; and, finally, in providing the pawl with a flanged holder that raises from and lets down the pawl into the ratchet.

MACHINE FOR PICKING AND CLEANING HAIR, WOOL, COTTON, ETC.—David M. Varney, Burlington, Vt.—The invention consists in a combination of the ordinary feeding bands of pickers, and a set of radial arms provided with movable comb pickers—said pickers being advanced and retracted by an eccentric groove so as to draw toward the center pickers at each revolution to clear themselves. It also consists in providing two perforated disks and a hood to create a current of air in the direction of rotation of the pickers, for the purpose of blowing out refuse, dust, etc.

PARLOR COOKING STOVE.—Edward M. Deey, of New York city.—This improvement consists of a modification of the base burning open fire heating stove patented by the same inventor February 21, 1871, whereby it may be converted into a parlor heating and cooking stove. The modification consists, first, in converting the principal portion of the body of the stove into ovens, and in an arrangement of flues and dampers therefor for suitably applying the heat at will; also for utilizing the ovens for air heaters. Second, in an adaptation of the magazine so that it is readily removed and its seat converted into a cooking top; third, in a pot-heating attachment to the horizontal part of the pipe behind the stove; and fourth, in the construction of the top plate for heating pots and other cooking utensils.

BLACKSMITHS' TONGS.—John Woodville, of Washington, Ind.—This invention relates in part to constructing blacksmiths' tongs with transversely notched jaws, one of which is bifurcated or grooved to receive the other, by which means they are adapted to hold rods or bars in a peculiarly efficient manner. It also consists of a sectional handle which is so contrived that, by shifting one section forward and backward on the other, the outer end taken in the hand may be adjusted, relatively to the other handle, as needed for holding thick or thin pieces between the jaws.

BRICK MACHINE.—Wm. F. O'Reilly, Starkville, Miss.—The invention consists in operating two pug mills, an intermediate press, and a mold supplier and discharger by the same operative mechanism, whereby bricks may be made in the most effective and workmanlike manner and at a reduced cost.

BEE HIVE.—Wirt F. Cunningham, of Middletown, Ky.—This invention furnishes an improved bee hive, which is so constructed as to facilitate the various operations of attending the bees, watching their condition, removing the comb, keeping out moths, etc. It consists more especially in closing and opening the front side of the base by means of a triangular roller which is pivoted within it.

COMBINED EXTENSION SKID AND LADDER.—Emanuel B. Field, of Yonkers, N. Y.—This invention furnishes an improved extension skid by means of which barrels of flour and other heavy articles are conveniently carried up a flight of stairs to an upper floor or down a flight of stairs to the basement; it may also be adjusted for use as an extension ladder for the use of firemen carpenters, masons, and others. It is made in two lengths, one of which is made to extend along and beyond the other, and is held securely in any position by means of pawls and ratchet bars. Various improvements enter into its construction, including a sliding carriage and windlass to operate it.

AXLE.—Charles Ahrenbeck, of Navasota, Texas.—This invention furnishes an improved iron axle for wagons and other vehicles which is stronger without being heavier than iron axles made in the ordinary manner; it consists in so forging a bar of the ordinary weight that the metal is upset, or forced from each end toward the point where the collar is swaged out of the same bar; by which means the weight and strength of the metal thus condensed is thrown on the points of greatest strain. The bottom edge of the journal is made oblique instead of horizontal, so as to allow the lubricating oil to flow back along it.

COMBINATION LOCK.—William A. Kerr, of Williamsport, Pa.—This invention relates to improvements in combination locks, and it consists in a novel arrangement of adjusting apparatus for setting a set of combination disks for locking and preventing the withdrawal of the bolt after it has been shot. It also consists in an application to the disks of an apparatus for returning them to the true position if they are disarranged after being turned away from the locking position and left in positions indicated by the letters of the word representing the combination on which it is locked. The readjusting apparatus is also applicable for use in changing the combination. This invention produces a lock that cannot be picked or easily blown up by powder, and which, if blown up, destroys the means of moving the bolt and leaves it unmoved.

APPARATUS FOR SINGEING HOGS.—Patrick Kenny, of Chicago, Ill.—This invention furnishes an improved mode and apparatus for singeing hogs to remove the bristles, hair, and other matters from the carcass preparatory to dressing it, and it consists in providing a number of furnaces arranged in a circle so as to leave a space between them for the carcass of the hog. In the inner sides of the furnaces are formed holes through which the flames are driven by a fan blower and made to impinge on the carcass. The carcass is introduced and removed in any convenient manner.

MEDICAL COMPOUND FOR HEALING WOUNDS, ETC.—Nicholas W. Gaddy, of Nichols, S. C.—This invention and discovery relate to a new and useful compound to be used as medicine for the cure of diseases, and to be applied externally for healing wounds and sores on man and beast; it consists in the distilled sap of pine, strained, clarified, and suitably prepared for use.

ELEVATOR BELT TIGHTENER.—William Merson, of Danbury, Conn.—This invention furnishes an improved device for tightening an elevator belt and holding it until laced, and it enables the ends of the elevator belt to be drawn together and laced by a single person. To the belt, near one end, is bolted a small plate or lug, to which is attached one end of a short rope, the other end of which is attached to a short shaft which is passed through holes in the sides of the elevator case, and the ends of which project and are squared off to receive a crank. The other end of the belt is secured to the case by screws. By this arrangement, by turning the crank the cord is wound upon the shaft and the belt is tightened. The crank is then reversed so that its handle rests against the case and holds the shaft from turning back while the lacing is being done. When the lace has been secured the device is detached, and the holes in which the shaft works are closed by caps.

FURNACE GRATE BAR.—William H. Settle, of Louisville, Ky.—This invention furnishes an improved grate bar which is so constructed that the slice bar or poker cannot strike against the sides of the separations and break the bar, while at the same time provision is made to protect the bar from the injurious effects of unequal expansion and contraction; it consists in making the bar of a peculiar form by which the poker or slicer is made to glance off instead of striking the bar.

WASHING MACHINE.—John C. Chase, of Monticello, Minn.—This invention furnishes an improved washing machine which is simple, compact, and without framework to get in the way of the person using it; it consists mainly of a large corrugated roller and four small plain ones, whose journals revolve in head blocks; the journals from the large one and arms from the head block rest in notches on the upper part of the tub. The peculiarity of the construction allows the small rollers to be conveniently unshipped when desired, and also adjusted in any desired position, according to the work to be done. Some of them may be used as wringers while the others are doing the washing.

SOLDERING APPARATUS.—Jacob Gulden, of Keyport, N. J.—This invention relates to a new apparatus for soldering the bottoms of tin cans to the sides of the same, and more particularly to the application to such an apparatus of the heat from gas flames, so that the process can be rapidly carried on by hand. It consists in the application to a metallic table of inclined soldering platforms with circular recesses and made of metal, which are heated by gas from beneath.

INSTRUMENT FOR PLUGGING TEETH.—Christopher S. Longstreet, of New York city.—This invention provides an improved dentist's plugger, the details of the construction of which would not be understood from a verbal description. Among the various improvements effected are an arrangement for regulating the weight of the blow struck and a provision for lubricating the shaft journal, etc.

TRACTION ENGINE.—William H. H. Heydrick, of Chestnut Hill, Pa.—This invention relates to improvements in traction engines or the propelling mechanism for steam plows, and it consists in an arrangement of devices for connecting the front axle with the frame or platform in a simple and efficient manner so as to admit of supporting the platform on a spring placed on the axle, and for confining the axle without the use of a king bolt passing through it, while allowing it the free universal oscillation needed for traveling over uneven ground. An oscillating plate and a housing are pivoted to the under side of the platform and also, at the lower side, to two strong braces. The axle lies across and within the housing, and between it and the top wall of the same, which is immediately under the plate, an india rubber spring is placed.

SHOE FASTENING.—Charles A. Rolfe, of Utica, N. Y.—This invention provides an improved mode of securing the buttons to ladies', misses', and children's boots or gaiters, and consists in an additional strap which runs the whole length of the fastening on the inside of the boot; a metallic clasp is secured to the strap where each button is to come by bending projecting portions of it round the strap. A wire staple with the bottom attached is passed through the boot and through holes in the clasp, after which the ends are bent down into the clasp by means of suitably formed pliers.

DOOR SPRING.—James Losee, of Peekskill, N. Y., assignor to himself and Joseph L. Cook, of same place.—This invention furnishes an improvement in the class of springs which are arranged vertically or parallel to the hinges of the door and which have a torsional action; it consists in the employment of a rubber cylinder, a spindle, a notched disk, a curved connecting arm or rod, and a screw, which are so arranged that the degree of torsion and longitudinal compression of the cylinder is governed by adjusting the disk and screw. By the construction, as the door is opened the rubber cylinder is both compressed and twisted, so as, when the door is released, to close the door by the elasticity of the rubber. The upward pressure of the rubber also tends to support the door, thus relieving the hinges and preventing the door from sagging.

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How Can I Obtain a Patent?

is the closing inquiry in nearly every letter, describing some invention which comes to this office. A *positive* answer can only be had by presenting a complete application for a patent to the Commissioner of Patents. An application consists of a Model, Drawings, Petition, Oath, and full Specification. Various official rules and formalities must also be observed. The efforts of the inventor to do all this business himself are generally without success. After great perplexity and delay, he is usually glad to seek the aid of persons experienced in patent business, and have all the work done over again. The best plan is to solicit proper advice at the beginning. If the parties consulted are honorable men, the inventor may safely confide his ideas to them: they will advise whether the improvement is probably patentable, and will give him all the directions needful to protect his rights.

How Can I Best Secure My Invention?

This is an inquiry which one inventor naturally asks another, who has had some experience in obtaining patents. His answer generally is as follows and correct:

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Preliminary Examination.

In order to have such search, make out a written description of the invention, in your own words, and a pencil, or pen and ink, sketch. Send these with the fee of $5, by mail, addressed to MUNN & Co., 37 Park Row, and in due time you will receive an acknowledgment thereof, followed by a written report in regard to the patentability of your improvement. This special search is made with great care, among the models and patents at Washington, to ascertain whether the improvement presented is patentable.

To Make an Application for a Patent.

The applicant for a patent should furnish a model of his invention if susceptible of one, although sometimes it may be dispensed with; or, if the invention be a chemical production, he must furnish samples of the ingredients of which his composition consists. These should be securely packed, the inventor's name marked on them, and sent by express, prepaid. Small models, from a distance, can often be sent cheaper by mail. The safest way to remit money is by a draft, or postal order, on New York, payable to the order of MUNN & Co. Persons who live in remote parts of the country can usually purchase drafts from their merchants on their New York correspondents.

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APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed, and are now pending, for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

7,813.—HORSE HAY RAKE.—H. W. Sabin. Oct. 23, 1872.
21,436.—COUCH FOR RAILROAD CAR.—F. R. Myers, F. H. Furniss. Aug. 21, 1872.
21,540.—HARVESTER.—A. Sherwood. Aug. 28, 1872.
21,541.—PIN STICKING MACHINE.—C. W. Van Vliet. Aug. 28. 1872.
21,574.—PREVENTING NUTS FROM UNSCREWING.—S. Noblet. Sept. 4, 1872.
21,749.—CROSS SEAMING SHEET METAL.—L. Fay. Sept. 25, 1872.
21,828.—FURNACE FOR TEMPERING STEEL.—P. G. Gardiner. Oct. 2, 1872.
21,879.—SELF MOUSING HOOK.—J. R. Henshaw. Oct. 9, 1872.
22,027.—PRINTING PRESS.—C. Montague. Oct. 23. 1872.
22,048.—LOCK.—L. Yale, Jr. Oct. 23, 1872.
22,049.—RAILROAD CAR WHEEL.—T. C. Ball. Oct. 23, 1872.
22,213.—RAILROAD CAR BRAKE.—A. L. Whipple. Nov. 13, 1872.

EXTENSIONS GRANTED.

20,999.—HOLDING CUTTERS IN PLANING MACHINES.—I. Gibbs.
21,059.—STEAM ENGINE.—H. and F. I. L. Blandy.
21,122.—TREATMENT OF CAOUTCHOUC.—A. G. Day.

DISCLAIMER.

20,727.—CARTRIDGE.—G. W. Morse. Filed June 29, 1872.

DESIGNS PATENTED.

6,012.—CARPET.—J. Barrett, New York city.
6,013.—BUTTON.—H. Henrich, New York city.
6,014.—SATCHEL.—J. H. Hitchings, San Francisco, Cal.
6,015.—CAMPAIGN BADGE.—J. P. Perley, Washington, D. C.
6,016.—TOY BANK.—D. A. Stiles, Middletown, Conn.

TRADE MARKS REGISTERED.

933.—TRUSSES.—Bartlett & Butman, Boston, Mass.
934.—GLOVES.—P. and F. G. Conklin. San Francisco, Cal.
935.—WHISKY.—J. R. Conway & Son, Baltimore, Md.
936.—MUSTARD.—Farrington, Campbell & Co., Detroit, Mich.
937.—WRITING PAPER.—B. & P. Lawrence. New York city.
938.—BITTERS.—W. H. Penn, Lindley's Mills, Pa.
939.—VELVET RIBBONS.—S. Trischet and J. Bondy, New York city.

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Value of Extended Patents.

Did patentees realize the fact that their inventions are likely to be more productive of profit during the seven years of extension than the first full term for which their patents were granted, we think more would avail themselves of the extension privilege. Patents granted prior to 1861 may be extended for seven years, for the benefit of the inventor, or of his heirs in case of the decease of the former, by due application to the Patent Office, ninety days before the termination of the patent. The extended time inures to the benefit of the inventor, the assignees under the first term having no rights under the extension, except by special agreement. The Government fee for an extension is $100, and it is necessary that good professional service be obtained to conduct the business before the Patent Office. Full information as to extensions may be had by addressing

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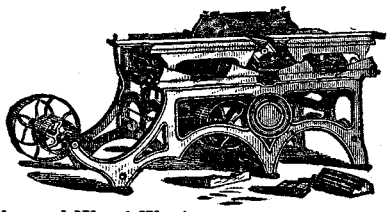

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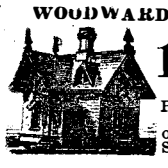

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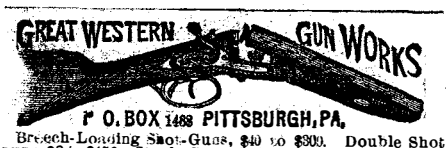

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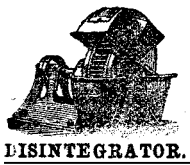

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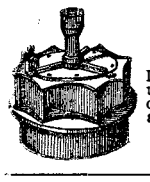

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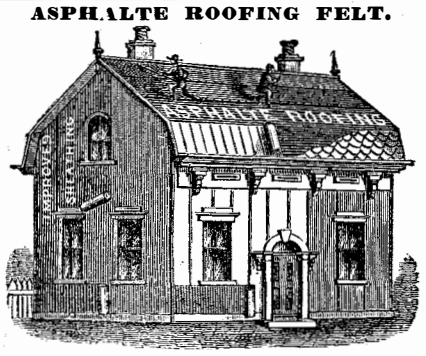

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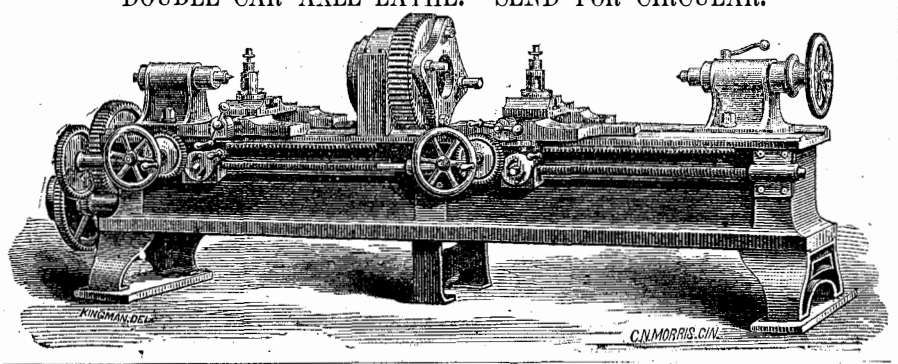

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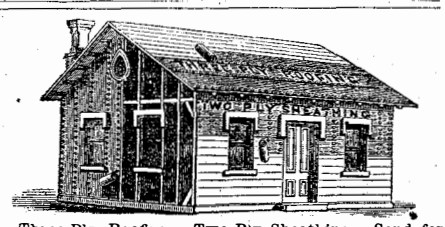

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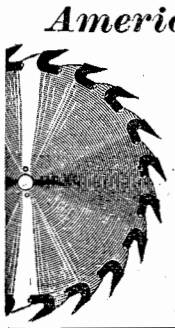

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